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SCIENCE, COMMUNICATION AND COMMON SENSE

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The problem I would like to address focus on the role of communication within scientific communities. More specifically I intend to examine at what extent some parallelism can be observed between the construction of scientific representations and their subsequent transformation in social representations. I will try to examine the continuity as well as the discontinuity between science and common sense in terms of the communication processes within and between them. This is the permanent agenda of the Social Representation Theory (SRT), proposed by Serge Moscovici 40 years ago.

In terms of communication processes no much progress has been done in terms of the trichotomy diffusion, propagation and propaganda, distinguished by Moscovici, in his seminal study on the Psychoanalysis. Years later it was again Moscovici to show how his model could be applied, at least metaphorically, to the communication strategies developed by scientists among them as well as in their direct or mediated contacts with the public in general. Although always recognised as central in the SRT, communication processes did not trigger the theoretical developments that can be observed either in the structural or even in the genetic approaches to Social Representations. Nature and content, maybe correctly were given priority over the processes. That the present Summer School has selected communication as its main theme is therefore to be welcome and enthusiastically endorsed.

I will make my presentation in three steps.

First I intend to show that communication processes are constitutive of social representations. In other words communication is to be understood not as transmission of information, but rather as more complex interaction processes

aiming at managing conflicting views and positions. I will argue that the theoretical approach of communication as symbolically generalised media might cast some light on the theory of Social Representations.

I will proceed next to the exam of communicational models of Science as proposed namely by Peirce and Popper, both of which also stress the centrality of communication processes in the collective construction of scientific knowledge.

Some less abstract specifications, borrowing from recent empirical research of social studies of Science will also be addressed. It will be argued here that notwithstanding the methodological constraints of the scientific method, social representations can also play a role in the construction of science.

This last point is further developed in the final section where I discuss the interface between science and society, nowadays turned more complex by the exponential growth of technology and its consequences on the social perception of risk.

1. Communication as media

Media is not here to be confounded with mass media such as press, radio and TV. The concept is borrowed from Talcott Parsons and refers to his theory of symbolically generalised media of communication. Instances of such media are money, power, influence and values. According to Parsons such media operate within the system of society, linking economic, political, juridical and cultural institutions. The media framework of analysis was later developed by Luhmann, becoming more comprehensive and more sophisticated.

Luhmann argues that communicative success is in his words, “exceeding improbable”. First of all it is improbable that ego understands what alter means.

Second, it is also highly improbable that the message travels beyond its immediate addresses. Finally it is also improbable that even receiving and understanding the meaning intend by alter that ego accepts to comply with the injunctions proposed by alter. Insofar as communication is constitutive of social systems, this is made

possible through developing strategies that transform what is improbable into what is probable. In evolutionary terms, as suggested by Luhmann, the emergence of language contributed to increase the understandability beyond perception. Media of dissemination such as writing and printing extends the reach of addresses both in space and time.

Finally the symbolic generalised communication media aims at increasing the motivation to accept. Still borrowing from Luhmann, the concept denotes “the media that use generalisation to symbolise the nexus between selection and motivation, that is, represents it as a unity. Important examples are: truth, love, property/money, power/law; and also, in rudimentary form religions, belief, art, and, today standardised “basic values”” (Luhmann, 1995 (1984, p. 161).

It is not possible here to enter in details but the idea seems clear enough. Each media, in this sense, comprehends a code, an internal logic, a set of norms, but also the mechanisms leading to change and boundary spanning. It is here that Luhmann mostly diverges from the structural-functionalism of the first Parsons. As a matter of fact the theory of Luhmann refuses that communication aims at leading to consensus. Rather, and more precisely, consensus lives alongside with dissensions. In the words of Luhmann: “if communication continues a double phenomenon of redundancy and difference emerges, and in this lies the content of communication principle of unrest ... If all information processing amounted only to redundancy, the danger of unanimously accepted misconceptions would be too great” (ibid p. 172). In a word the media process reduces and at the same time increases the improbability of success. Once again the metaphor of Janus facing opposite directions.

Although briefly summarised the model does not seem to me as far apart from the theory of Social Representations. On the contrary some complementarities are obvious. It could for example be argued that the “rudimentary forms” of religious beliefs and art correspond to the collective representations introduced by Durkheim. In the same vein the standardised basic “values” of today, seem to correspond to the over-growing corpus of social representations described in a

number of studies. But it is once again Moscovici that has pointed to such convergence of perspectives when in the “Machine à faire des Dieux” he suggests that money is a social representation. In a more recent text the idea is reiterated in the following terms:

“I suppose that social representations in movement more closely resemble money than language. Like money they have an existence to the extent that they are useful, circulate, take different forms in memory, perception, works of art, and so on, while nevertheless always being recognised as identical” (1998, p. 244).

I am not suggesting that Moscovici is borrowing from Parsons or from Luhmann, at least in the sense of accepting their sociology of economic exchanges, but rather that he is describing a mechanism similar to the symbolic generalisation operated by social representations that, as such, could be assimilated to media. It is in this sense that we also understand that communication media are constitutive of social systems. It corresponds to the apparent paradoxical circularity of groups defined by the social representations that they produce. It is this continuous gestalt switch between media and message that could be labeled as autopoiesis.

Coming to less generalised media as it is the case of more ephemeral representations, they are first triggered by the unfamiliar, the strange, as claimed by Moscovici. In Luhmann we can read:

“One of the communication’s most important achievements is sensitising the system to chance, disturbance, and “noise” of all kinds. In communication one can make understandable what is unexpected, unwelcome and disappointing” (ibid p. 172).

In order to cope with such “differences” the strategy thus consists in mobilising “contributions” around “them” that, overtime, become “redundant”, but not necessarily forever frozen.

From here one may derive some heuristic suggestions for a more systematic approach to the study of social representations. The “fil rouge” would be the uncovering of the underlying internal logic that stabilises a local social system and

also in what sort of more general media - love, truth, power, money, it comes to be anchored.

On the light of the above we can now propose a new interpretation for the communication strategies of diffusion, propagation and propaganda. They are probably situated at different levels of analysis.

Diffusion rather corresponds to enlarging the media of dissemination. It aims at overcoming the boundaries that restrict communication to endogenous audiences.

Of course there are always problems of translation. But reduction of uncertainty is here limited, at least ideally, to the syntactic and semantic levels.

Pragmatics emerge with propagation and propaganda. Here motivation to comply comes to the forefront. Through propagation, as shown by Moscovici, the objective is to handle the conflicting ideas through negotiation, whereas propaganda is invoked to exclude any difference. In Parsonian terms propagation anchors on the "influence" media whereas propaganda anchors on "power" media. In both cases competition seems to come to the forefront.

In metatheoretical terms and in accordance to Wilden (2000) prevalence of competition over cooperation could be a cultural trait of modern western societies, whereas in other societies the reverse, cooperation over competition, would be the prevalent orientation. The pervasiveness of competition also expressed in Luhmann's model of communication and action, could be an explanation for the problematic self-regulation of the ever accelerating rate of change that can be observed in Western cultures. I will come again to this point in the third section.

2. Communicational Models of Science

Post-positivistic models of science look decidedly anti-Cartesian in the sense of shifting the emphasis from the individual genius to the collective work accomplished in scientific communities. It would require a book to discuss the

arguments nourishing the epistemological debates of modern and post-modern times. I limit myself here to briefly evoke some paradigmatic examples.

Let me start with Pierce, maybe one of the most vehement opposers to the Cartesian individualism. Pierce considers the practice of science of requiring not only cognitive abilities but also an ethical dimension. He distinguishes three moral factors: the “love of truth”, the “sense of community” and the “sense of confidence”.

The love of truth does not exclude other interests such as money or fame. The important point is however the priority given to truth. But alongside with truth, Pierce also mentions the “sense of community” and the “sense of confidence”, thus pointing to the social and historical dimensions of science. In a well known passage he writes:

“The method of modern science is social in respect to the solidarity of its efforts. The scientific world is like a colony of insects in that the individual strives to produce that which he cannot himself hope to enjoy. One generation collects premises in order that a distant generation may discover what they mean” (CP 7 - 87).

This could be understood only as an external feature of cooperation without affecting the “scientific method”. About such an issue the views of Pierce are no less revolutionary. To the traditional couple of deduction-induction he proposes to add retroduction or abduction, as the moment where discovery eventually emerges.

“Observe, writes Pierce, that neither Deduction nor Induction contributes the smallest positive item to the final conclusion of the inquiry. They render the indefinite definite; Deduction explicates; Induction evaluates: that is all. ... every plank of its advance (science) is first laid by Retroduction alone, that is to say, by the spontaneous conjectures of instinctive reason; and neither Deduction nor Induction contributes a new single concept to the structure (Selected Writings, 1908 - p. 370- 371) (CP 6 - 475).

But how to account for the heuristic role of retroduction, articulating both, deduction and induction? Peirce starts by suggesting evolutionary factors but also adds historical and social factors. Selection of hypothesis are guided by a sort of intuition complemented by criteria useful not for short-term individual purposes but rather for long-term collective benefit.

As remarked by Delaney - “an hypothesis is recommended to the degree that its pursuance at this point in time would move the inquiry along most efficiently. His invocation of the game of Twenty Questions is instructive. In this game a line of questioning recommends itself not in terms of the likelihood it will hit upon the correct answer immediately but in terms of the role this line of questioning will play in getting the answer eventually ... the justification of the abductive rules is not in terms of the community of investigators of which he is a number” (40/41).

In sum we found in Peirce a vision of science as a continual social construction that nevertheless does not fall into the trap of the post-modern relativism in that for Peirce the control role of validation is essential not only here and now, as applied to local specific instances, but mostly when projected in the future, as a general mechanism of self-regulation. Such a view, as I see it, renders the epistemological stance of Peirce very close to the communicational logic of truth as symbolically generalised media.

It was however several decades later that the communicational model of science came to the forefront due to the seminal work of Popper and Kuhn, who only retrospectively could be linked with Peirce. Usually we associate Peirce to semiotics and pragmatism and only marginally to the philosophy of science.

Fleck with his proposals of “thought styles” and “thought collective” as well as Merton in publishing in 1937 “Science, Technology and Society in Seventeenth Century in England”, are other examples of authors whose contributions to a communicational model of science became acknowledged only retrospectively.

Regarding both Popper and Kuhn everything was already said. It is however worth to recall for the present argument that shifting the validation criteria from

transcendent sources such as the reason or the experience, to the legitimation by peers, the agenda for the sociological studies of science became set.

Opened to the curiosity of social scientists the scientific practices became more visible losing part of its mystery and charisma. The fashion of closing the gap between science and common sense was most of the time exaggerated. The role of "truth" was underplayed in favour of other media processes such as "power" and "influence". This was not in the mind neither of Peirce nor of Popper, nor even Kuhn. Of course scientific practices are not exempt of power games played by scientists, of course science as all sort of knowledge is socially constructed and validated, but this is not incompatible neither with criteria of objectivity nor with the fact that as claimed by Bhaskar, "the objects of scientific discovery and investigation are "intransitive", that is, they exist independently of all human activity (1975, p. 35). Rocks are there and always were there is certainly a formula denouncing a robust common sense, but difficult to falsify by whatever sophisticated rhetoric. Also difficult to falsify is the enormous success of science demonstrated by its technological applications.

Discounting the overstatement the social studies of science were and still are important in their contribution to better understanding how science is made, thus complementing the normative view of how it should be made.

It is now more clear that talking about science in general as pursuing an uniform paradigm is exceedingly abstract. The field of science is richly differentiated, this being one of its most salient features. In broad and rather general terms we have now the sciences of the matter, the sciences of life, the sciences of nature and the sciences of the society. All of them in the plural. Systematic observations of the activities carried out within those different communities lead to suggest that continuities leave alongside with discontinuities, that the entire field is a sort of fuzzy set, language games, without a common and stable set of properties. This impression is reinforced if we embed the technoscience system on the public space to which it is linked.

I would like at this point to refer to recent work of Karin Knorr-Cetina - Epistemic Cultures, where the author, in line with her previous studies, shows how different scientific fields develop their own communication strategies, but also at what extent their outcomes are conditioned by those strategies.

Knorr-Cetina examines laboratories working on particle physics and on molecular biology, the former illustrating the functioning of big science, organised as a multinational corporation, and the latter fragmented in smaller units with corresponding organisational formats.

It is mostly in big science that the popperian ideal of open society seems to be at work. According to the field observations of Knorr-Cetina the communicational pattern therein found shows an atmosphere of trust, lack of protagonism - suffices to say that papers are signed by 1500 to 2000 researchers in alphabetic order, Nobel prizes included Cooperation, coupled with flexible coordinating mechanisms of mutual adjustment, informal exchanges and participative decision-making.

In contrast the atmosphere in the field of molecular biology is just the opposite in that protagonism becomes the rule, researchers developing their personal career strategies, leading to competition and mistrust, more centralised structures and decision-making processes. The contrasts are not only in such peripheral features but also emerge at deeper levels of epistemological paradigms and research strategies.

Whereas physicists emphasize measuring and the interaction of the system with itself, as a sort of self-referential referential mechanism biologists operate in more inductive terms, using blind variation and natural selection, in order to maximize the contact with the empirical reality. Such observed differences could be attributed to different stages of science. The idea or the representation that Physics is the most paradigmatic science appears as rather consensual. But the interesting point I would like to retain is the finding of the systemic coherence generated by the interplay of symbolic media. Whereas in the more paradigmatic

Physics, the field is structured by the “search of truth”, in molecular biology the game in the town is less stable, crossing truth with power and influence.

One last but no less fundamental remark concerns the practices and representations of scientists themselves in the two sorts of laboratories observed by Knorr-Cetina. As reported by the author, the high energy laboratories are complex socio-technical systems whose efficacy depends on the performance of sophisticated devices such as colliders and detectors. An experiment does not greatly differ from a big technological project. Scientists were observed to establish a quasi-human relationship with the technical equipment. In the words of Knorr-Cetina machines are represented as organisms. A rich vocabulary illustrates this metaphorization, attributing to machines physiological as well as moral features. Furthermore, physicists become, so to say, extensions of the objects with which they work, a kind of “symbionts”, to use the word here proposed. But, on the other hand, they collaborate, working together in a common project. The enemy in this case, is the “background”, as a source of noise. On the side of molecular biology the reverse was observed. Here organisms are transformed in machines or, more precisely, into production sites and into molecular machines. This, as suggested by Knorr-Cetina, because “molecular biology sees life as a self-reproducing biological machines” (156). And the machine metaphor leads to “genetic engineering”, which suggests that molecular biology is more a branch of technology than the sciences of botany and zoology, where it started (ibid, 157). Once life is reduced to mechanical processes, and once the laboratory organisms are artificially constructed, manipulation pose no ethical concerns.

What those empirical observations seem to suggest is that the dynamics of social representations also play a role in the laboratory life, as a sort of common sense supervening, or superimposed to the technical activity of the scientists.

Knorr-Cetina uses the concept of “reconfiguration” and invokes the primitive classifications introduced by Durkheim and Mauss. Are such representations necessary for the work of science? Are they related with the scientific method?

The answer is obviously no. Anyway they are there, they are currently used. And, as suggested by the theory of social representations, scientists feel the need to make sense to their practices, and this is achieved through a coherent narrative objectified in organic/mechanical metaphors, setting the stage for generalised shared exchanges. Such a dynamics, also suggests that scientists like everyone else are able to establish a sort of ironic distance between themselves as human beings and the role they perform as scientists, or as technicians. Of course they don't believe that the collider is not "cooperating", or "is sick", as anyone of us in front of our "idiosyncratic" terminal. That such representations come so spontaneously to our minds, and further stabilizes in a rich and shared language, and more importantly, that such "reconfigurations" become not only systematic but also systemic, being instrumental to confer internal cohesion to the groups from which they arise, all of that, so I presume, point to figure that symbolic media operate at different levels and contents but always in accordance with the same underlying logic.

3. Science and Society

I come now to third and final section of my presentation where I propose to discuss the multiple communication interfaces between society and scientific communities. More specifically I would like to examine at what extent social representations developed at the level of public space influence the construction of scientific representations.

It must be stressed at first that the relationship between science and society have greatly evolved in the last decades, namely after the second world war. Science and technology are more differentiated, mass media have increased its role in the popularisation of science, alongside with closer reciprocal dependencies between science and political rulers. Citizens became also more politically aware developing mixed feelings about the benefits of science and technology. It is

difficult to ignore the enormous progresses made in the general quality of life, but there was also the nuclear energy, the pollution of the environment and, more recently, the concern about the applications of biotechnologies.

Eurobarometer data show that since 1993 the question about to whom the respondents trust in telling the truth about biotechnological applications, the NGO are ranked in first place whereas scientific institutions are ranked in the fifth position. Such result was observed in all European countries. But the same respondents and also consistently across Europe believe in the capacity of science in improving the cure of diseases.

As well known Moscovici set the agenda of SR research focused on the ever-growing presence of science and technology on the public space. Social representations are the outcome of a communicational process that turns the unfamiliar into familiar. But there still remain a number of theoretical issues waiting for a clarification. For example, whether social representations are to be considered as a sort of Platonic shadows of scientific representations which amounts to question about the epistemic continuities between science and common sense. Another issue is the role of popularisation of science, namely the sort of mediation exerted between the two worlds - the reified and the consensual. Still another issue is the type of communicational patterns linking the interfaces, at what extent the communication is seen as flowing from a source to a target or rather designing more complex systemic patterns with single or even double feedback loops.

Anyone of the above issues would require lengthy digressions but I have to be brief and inevitably schematic. Let me start by the metaphor of the two worlds.

As summarised by the Portuguese sociologist Sousa Santos "The distinction between science and common sense is made both by science and common sense, but it has different meanings in each case. When made by science it signifies the distinction between objective knowledge and mere opinion or prejudice. When made by common sense, it signifies the distinction between an incomprehensible and prodigious knowledge and an obvious and obviously useful knowledge. It is then

far from being a symmetrical distinction. Besides when made from the point of view of science, the distinction has a power that is excessive in relation to the knowledge that makes it possible. Like all specialised and institutionalised knowledge, science has the power to define situations beyond what is known about them. That is why science can impose, as an absence of prejudice, the prejudice of pretending to have no prejudices” (1995, 46-47).

It is against these prejudices that sociological and philosophical studies on science led to propose different views. As regards for example objectivity it is not clear that even from the liberal popperian standpoint the internal debate within scientific communities would be sufficient to ensure such objectivity. The concept itself requires further distinctions and qualifications. It can be argued, recalling Peirce, that objectivity is better seen as a moving target and also that validation does not stop at the door of the laboratories. Instead, the ecological falsification suggest significant revisions on the theoretical models. Besides, and well known, the criterion of falsification, easy to accept on theoretical grounds, is not that easy to apply in the current practice of science. Experiments are difficult or made difficult to replicate and even when falsified, which is never sure to be the case, they benefit of a moratorium, until better models are not discovered. This could explain why pragmatic criteria could eventually be preferred.

To borrow again from Sousa Santos: “Common sense is practical and pragmatic. It reproduces knowledge drawn from the life trajectories and experiences of a given social group, and asserts that this link to group experience renders it reliable and reassuring” (ibid, 47). It is precisely because local and pragmatic that common sense is able to exert a complementary role in the validation of scientific hypothesis, as a rule more general and relying on “coeteris paribus” proviso. When for example agricultors raise doubts about the use of certain pesticides they are right in invoking their local experience which is not considered by scientists in their standard laboratorial tests. The multiplication of such episodes might lead to a growing permeability of boundaries and to a more balanced communication

between the reified and the consensual worlds, which anyway remain epistemologically distinct.

Communication gains to be seen not only as information flow but rather as a negotiation process aimed at managing conflicting views from various sources. Which leads me to the second topic I would like to address, related with mediating links between science and the public.

Maybe it is not enough to consider two worlds. Mediation implies at least a third party. Mass communication is an obvious candidate, tending to acquire its own epistemological status and role. In the theory of social representations it is not always clear whether communication fall in the two-step flow model, which would imply a first link between the source and the opinion leaders and a second one between these latter and their final audiences.

As regards mediating between science and society the traditional role has consisted in the popularisation of science. Another topic that would require one or several books. In Portugal the term used is “divulgation” in the sense of “diffusion”, which seems less pejorative. With the growing impact of science in society there has been an equivalent development of those activities at least in the Western industrialised world. Sometimes it is carried out by scientists themselves, at best by specialised professionals, but also by generalists who usually limit themselves to transmit news from secondary or terciary sources.

Attitudes of scientists towards the popularisation of science are somewhat ambivalent. Empirical studies conducted by as suggest that scientists welcome the visibility acquired by science legitimating its charismatic leadership, but on the other hand and by the same token, they are affraid that through simplifications might lead to false expectations that at the end of the day backfire on the image of science. Such apprehensions are certainly well grounded.

Popularisation can also be seen as instrumental, not only for diffusing the outcomes to the general public but also for the process of scientific research. Through popularisation scientists become acquainted with topics developed in other scientific areas. One may remind the strategy of propagation, as applied to

Moscovici to scientific exchanges, as aiming at triggering interdisciplinary contacts. But even when it does not correspond to a strategy any exposure that enriches the “requisite variety” of subjects is important for the abductive processes described by Pierce.

The popularisation is also instrumental either in teaching, in writing proposals or in addressing lay audiences, for example, when playing the role of expertise.

Finally popularisation can be viewed as a necessary step in the internal construction of science, in that some sort of translation is required in articulating the hypothesis. Besides, even the scientific papers submitted to peer review are not exempted of rhetoric as well documented in a number of studies about scientific practices (Knorr-Cetina, 1981).

In light of the above it may be argued, once again, that frontiers are fuzzy, and that between science and society we can find a long chain of intermediate links, designing a complex pattern of systemic communications. Symbolically generalised media may help to reduce the uncertainty but one must be aware that complexity implies an ever-growing improbability.

To conclude with a note of optimism I would like to invoke again my colleague Sousa Santos when he suggests that we are on the verge of new common sense, an emancipatory common sense as a integrating piece of an emancipatory knowledge. According to him this would imply a double epistemological break. The first epistemological break led science to distinguish itself from common sense, but now a second step is yet to be accomplished reconciling science with common sense.

A number of signs already point in that direction - political leaders as well as citizens are now more aware that when it comes to take decisions involving risk and uncertainty the contribution of experts is only a factor and not always the one more heavily weighed. Already in the middle of nineteenth century Conte considered that science was too much important to be left at the hands of scientists. But if for Conte, as suggested by Bensaude-Vincent (2000, p. 86), such a stance still implied a dogmatic conception of science, considered as the salvation of humankind, in modern times we became more skeptical but also more aware that

any possible reenchantment of our world passes through communication, however improbable it might be.