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Representations and social coordination of action

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Synthèse :

L'observation du monde monde quotidien, notamment dans l'entreprise, fait apparaître que les individus ont constamment recours à des artefacts (textes, messages...). Ceux-ci sont des représentations publiques, qui rendent visibles et disponibles à un grand nombre d'acteurs un état de choses passé, présent où à venir ("constat", "projet", "objectif"...). Ceci afin que, individuellement, chacun puisse agir conformément au cadre de référence collectif.

On montre sur un exemple comment un telle représentation publique permet de réaliser, collectivement, un état de choses prévu par quelques uns (en l'occurrence, comment une conférence se réalise à partir de l'appel à communications). Cet exemple trivial permet de clarifier le rôle des représentations circulantes dans la coordination de l'action et la division du travail.

On montre, en particulier, que les systèmes de représentations sociales (c'est-à-dire, à la fois publiques et reconnues comme telles, et orientées vers l'action) permettent de :

- réaliser une division active du travail, dans laquelle chaque opérateur fabrique lui-même son programme de travail à partir de la représentation qu'il reçoit ;

- coordonner l'action dans le temps et l'espace entre opérateurs (en permettant à des acteurs distants de travailler sur le même objet comme s'ils étaient en coprésence).

Le lien avec la théorie de l'action située permet de montrer comment, concrètement, la représentation, actualisée en contexte, permet de construire des actions pertinentes en utilisant les ressources disponibles localement. On montre que ce système est à la fois plus performant qu'un système de distribution a priori du travail (parce qu'il permet d'utiliser les ressources locales, et d'économiser des explications) et en même temps plus robuste (parce qu'il est plus flou et permet donc de s'adapter aux contextes locaux qui ne pourraient pas être vus depuis une coordination centralisée).

On montre également que, paradoxalement, la représentation n'a pas besoin d'être la représentation "de quelque chose qui existe" pour jouer son rôle de coordination.

1. Why use the theory of social representations ?

We are interested here in the mechanisms of co-ordinated action, and we shall investigate the question within the theoretical framework of social representation theory. We shall use the ordinary office work for demonstration field. Why social representations ? Why office work ?

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Co-ordinated action implies that actors share some common, and pragmatic, views of the objects and concepts of the setting within which and upon which they act. At the level of society, the setting is "the World", and such common mental constructs, called "social representations" [Moscovici, 1961], are "a kind of knowledge, socially constructed and shared, having pragmatic purpose and contributing to build a common reality for the community" [Jodelet, 1989]. Those shared constructs stand as a common reference system for members of a given cultural group. They are shared by the members of the group, and the group assumes that they are shared.

The existence of such objects as social representations has naturally been recognised in other disciplines concerned with groups and psychological processes (anthropology, sociology, cognitive science, economics, game theory, etc.), sometimes under other names. *Culture, common sense, schemata, conventions, common knowledge* - to name those only - roughly refer to the same system of common referents through which socialised beings think their environment. So, various theoretical frameworks allow studying those social/mental constructs which social psychologists call social representations[2].

Still, social psychology, the discipline in which the concept is most central and salient, has, over years of continuous focus on the question, developed the largest corpus of data, as well as sophisticated theoretical and technical apparatus for their description and study [see Jodelet & Ohana, 1993, for a review]. The current structural theory of social representations proposes to figure social representations as combinations of basic nuclei -that is some elemental concepts, "cognems", or traits, that are mentally associated in the subject's minds, constituting the core and peripheral elements of the representation [Abric, 1993 ; Guimelli et Rouquette, 1992]. Unlike many models of shared mental constructs coming from other disciplines, this model has been supported with empirical evidence from a large range of studies ; and methods fit for exploring and describing the representation's structure are available [e.g. : Abric 1994a &b ; Flament 1992, 1993, 1994 ; Guimelli 1994 ; Lahlou 1995a ; Moliner 1992, 1994 ; Rouquette 1994].

Social representations can serve as a World's user's manual. In context, for individual actors, they potentially generate action scripts articulating the basic nuclei, hereby providing co-ordinated action at the scale of society [Lahlou, 1995a, 1996b].

It is this co-ordinating role of social representation that we shall address here.

At a smaller scale than society, in formal groups and organisations, where specific tasks have to be accomplished, the need for co-ordination is more obvious. It is also easier to study. As March and Simon [*1958*, 1991 pp. 2-3] point it out, communication canals in formal organisations are much more specific and *explicit* than the mass media, in their circuits and content. The study of specific, limited tasks in formal organisations therefore provides a good field for detailed study of the mechanisms by which actors use representations and communication to co-ordinate their actions. As Cicourel [e.g. : 1994] demonstrates, in this co-operation process, social organisation, social interaction and information processing are intricated. This interaction is complex, but studying the overt aspects of the interaction can shed light on its mechanisms, provided that description is done at a very fine grain of detail.

And indeed, detailed description of the situated action that occurs when individuals interact collectively with representational artefacts has brought great progress in our understanding of the role of shared representation in co-ordinated action [Conein & Jacopin, 1994 ; Hutchins, 1994, 1995]. This approach stresses the importance of public representations -of objects, tasks, or states of the world- in

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[2] The term "REpresentation" unfortunately carries inadequate connotations in some other disciplins, where it is associated with a naïve epistemology considering that there would be "real, given, objects in the world" which produce "an image of those objects in the brain", and leaving out the constructive aspects of cognition. This leads to deeep misunderstandings with, for example, some branches of cognitive science.

the co-ordination of actors. In the course of action, and of propagation of representations, large parts of the representation are made public in the form of documents, messages, plans, or various information artefacts (e.g. : instruments, measurement devices...). Following Hutchins [1994] we consider that studying those public representations thus enables us to view the contents of the "black box" of the *system*, more easily than trying to peep inside the *subject's* mind, were lay another, but less accessible, version of the representation.

All these public representations (documents, plans, messages...) are called "information" by the subjects. But what exactly is information ? On the field, obviously, information is a means of co-ordination. Let's have a closer look at what it is made of.
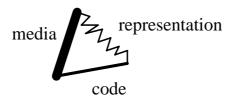
2. The nature of "information"

In the course of a current research programme « Information in the workplace » [Lahlou & Fischler, 1996], aiming at understanding what is the final outcome of information flow (and overflow) in formal organisations, we obtained the structure of what "information" means in common language. We used systematic analysis of dictionary definitions of all the terms connoting by « information », with a method designed for exploring the structure of social representations.

The method extracts the basic nuclei of social representation from discourse samples produced by an informed source (a population, a dictionary...) [Lahlou, 1995a, 1996a]. A corpus of statements (sentences in natural language) about the object (here : "information") is obtained through association technique, then processed with a lexical data statistical analysis software, ALCESTE [Reinert, 1983], yielding classes of statements with similar lexical content. Those classes are considered as the basic nuclei. This method of interpretation [Lahlou, 1995b] is a kind of quantified, detailed, content analysis, aiming at the « connections » [Whorf, 1956] between traits, that is, the association links which are common in a given culture. Here, we used a large French dictionary (Le Grand Robert) as public source.

Seven nuclei [details in : Lahlou, 1994] have been identified as elements of the representation of "information". The first three, *Media*, *Code* and *Knowledge*, describe aspects of the objets classically studied by [Shannon & Weaver, 1948], a domain improperly called « information theory » since it does not deal with the information *meaning,* but with its *transmission*. We suggested [Fischler & Lahlou, 1995] the neologism of "recom" (representation coded on media) to name the observable units of transmitted "information".

Figure 1 : The recom

Recom (fig. 1) is "a piece of information", an empirical information unit, that can be "handled", used or processed by subjects -and observed. For example, a memo (*instructions* written in *English* on a *sheet of paper*), a letter, a film, a sign, etc. are recoms. This concept has proved useful in our field observations.

Four other nuclei were found in the analysis of *information*. They refer to various forms of recom propagation. *Acquisition* and *Warning* are one-way transits of recoms, coming to or emitted by the subject. Another nucleus, *Education*, is a co-operative transfer of recoms from one subject to another.

The last, *Instituting*, is the most interesting for our organisational studies. The underlying phenomenon is that of an official explicitation of something, before witnesses, in the legal sense of "statement". The crucial point is this *collective validation* of a state-of-things (further abbreviated into « ST »), in the most constructionnist perspective. This validation can be established by institutions or individuals collectively delegated (doctors, experts, judges, commissions, etc. : any agent with legitimate authority). This nucleus, which underlines the procedural aspects of information and its institutional role in the founding of social reality, is pertinent for our research in the workplace. It enlightens the role of memorandums, programmes, reports, meetings, regulations etc., which constitute a large amount of the so-called paperwork and red tape.

Finally, we'll say that :

A piece of information is a representation of a state-of-things[3]. This representation is publicly available in the form of *recoms*, which are, fortunately, observable phenomena.

The propagation of recoms may take various forms, and may provoke changes in the receivers. We are here coherent with Bateson's view [1957, 1961]: *information is a difference that makes a difference* ; or : the news of a difference. And also with MacKay [1972, p. 8] : *"Information-for-an-organism is operationally definable as that which confirms or changes its internal representation of its world."*

3. An empirical approach

This first sight at the problem led us to set up observation protocols focused on the use of recoms in the workplace. In two large organisations, 30 (2x15) office workers were investigated with a protocol using psycho-social and cognitive techniques. Semi-directive interviews were combined with detailed description, by the subjects, of what they did with the incoming "information" (in fact : recoms). Then subjects were asked to comment a thorough "office-check", where they would describe the nature and content of their desktop, files, stacks, drawers, shelves etc.

Interviews were tape-recorded and reviewed by the interviewers.

The analysis of this rich material yielded various results, including some cues on the mechanisms of "information overflow" [Fischler & Lahlou, 1995]. We shall for our purpose here concentrate on a single case that will root our model.
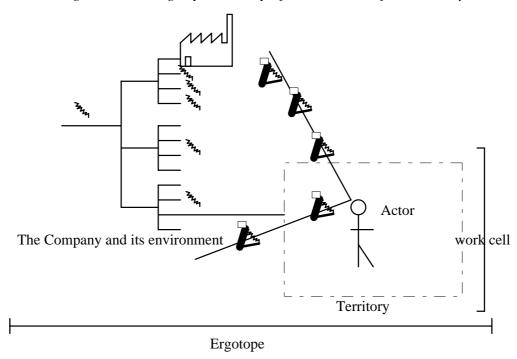
3.1 The objects studied

Activities of individual subjects in the company (actors) seem to be oriented towards modifying the state of a given setting, their work environment. Depending on their specific role and position, actors will focus on a given set of objects that constitute their relevant work environment, which we call their "ergotope" (their work biotope [Fischler & Lahlou, 1995]). Those environments will differ from actor to actor : what is relevant for engineers is not necessarily relevant for accountants. Still, all actors more or less share some elements of their environment with others, so that communication remains possible at least on those elements.

The appropriate cognitive system to study is the actor plus his close environment (e. g. his desk and office room -or territory-, close colleagues, and technical equipment), which we call the "workcell".

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[3] "Bild" (Wittgenstein, 1921, 1961: 2.1 et seq. pp. 50-51). In this "picture", the elements are linked to one another as the elements of the objects they represent. In our perspective, the meta-communication elements helps structuring every message received into a representation of a ST. What is apparently an « order given by B to A» or « a joke », is received as the recom : « the representation of A ordering to B to do this ; or « A representing this story as a joke » etc.

Figure 2 : The "ergotope" and its projection in the subject's territory

Albert is the actor. His office (room) is his territory. Albert + his territory and what it contains are the work cell. Albert's company, its clients, its suppliers, are Albert's ergotope.

The territory contains some overt representations of the ergotope, that serve as accessible and handy references of the ergotope for the actor. For instance, a given client (or a project) will be represented by a file (paper or computer). Actors compute upon those artefacts, which in turn propagate representations until they finally emerge somewhere in the real world in the form of an action modifying a ST. For instance, an accountant A will "pay" an employee E by running a specific computer program on the section of a payroll file that represents E. This operation will in turn propagate a series of recoms (bank order, etc.) in distant workcells, that will eventually end into E getting a handful of banknote. But A might never see E "in person" ; all he knows is E's numerical representation as a file. And all he needs to know is how to deal with A's numerical representation[4]. Obviously, material representations -recoms- do play a major role in co-ordinated action ; *they* (and not what they are supposed to represent) are the objects which are really manipulated and processed by actors. To understand how, let us focus on the post-it case.

4. The post-it case

One of our subjects says (translated) :

> " Subject : Well, in the morning I have more or less 5 messages [in the phone answering machine]
>
> and generally those are messages left from the day before most of the time (...)
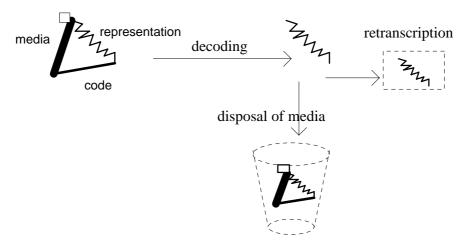>
> Interviewer : What do you do then ?
>
> S : I take notes (...) I have post-its generally (...)"

The subject receives recoms, in the form of oral messages on his answering machine. As he listens, he transcribes (parts of) them on post-its. Post-its are more handy and stable recoms than vocal

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[4] This is what Roqueplo [1990, p. 75] calls "savoir décalé".

messages ; they can be handled, re-ordered, etc. without saturating the fragile working memory of the actor.

Figure 3 : opening a recom in the incoming cycle

Then he tries to "process" the content of the recom (by calling back, executing or planning some task...), and disposes of the original media (the vocal message, the post-it : infra, line 11). Often, the "recom processing" is ended by re-transcribing some *action script* to do (e.g. : GO TO a meeting) on his agenda (cf. infra line 12).

In doing so, the subject has applied twice in a row (to the vocal message, then to the post-it) the "incoming recom processing cycle" (decoding, re-transcription, disposal : Figure 3).

The sequence as described by the subject is more complex. He tries to process the recoms (the post-its) right away (line 1), to avoid (another) transient re-transcription on his agenda. He can't (line 5), and that leads him to build a buffer system (line 6).

1. " (...) the post-its, well, I leave them to see whether I can process them right away.
2. If I can't process them,
3. then I rewrite [literally "réinscris". He means : copy] them,
4. well that is the case for instance this morning,
5. the post-its I couldn't process ["traiter"] them yet, well,
6. so I stick them in front on my agenda.
7. And if I can't process them, if I'm sure that I can't process them because I don't have the information,
8. [because] I can't call back the person or (s)he is not available,
9. then I keep them in the organiser,
10. so I put them in the column "done/to do".
11. So I shall throw away the post-it
12. and keep this in fact in my agenda...
13. That's the way I do"

Obviously, the subject uses many information artefacts (answering machine, post-it, agenda...), to cope with the incoming representations, and guide his own behaviour, immediately and in the future. He does so by giving himself instructions or data on his agenda (a structured media, which has, in-built, an action-triggering characteristic). Hereby he modifies his own cognitive environment, with the contents of the representation received through the recom, so that this environment will provide him,

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later, at the right moment, relevant resources for action (data and instructions). The feedback properties of the setting are hereby manipulated by the individual. One may notice here, that what is usually considered as a single actor (e.g. "Albert"), lasting through time and space, can be considered as a population of short sighted, instantaneous and context driven actors (Albert[t]), occupying a series of successive locations in time and space, and co-ordinating with "himself" by sending stimuli to his successive occurrences : Albert(t) guides Albert (t+n) by writing on his agenda what to do. We shall come back to this point later.

What is now interesting to us is this re-transcription process (line 12, where by *«this»* our interviewee refers to the representation). To make this process more understandable, we shall describe it on another (real) example of which we can share the references with the reader[5]. In the course of this process, we can capture "live" the appearance of social representations in their co-ordinating role.

5. The Conference announcement case

description : Let us say subject "Albert" receives by the mail on Sept. 1st, 1995, the following recom (Figure 4).

Figure 4 : The announcement -call for papers

UNIVERSITE DE PROVENCE
(Aix-Marseille I)
UFR PSYCHOLOGIE, SCIENCES DE L'EDUCATION

LA TROISIEME CONFERENCE INTERNATIONALE
sur les
REPRESENTATIONS SOCIALES AURA LIEU

les Vendredi 27, samedi 28, dimanche 29, lundi 30 Septembre 1996
à Aix-en Provence et Montpellier (France)

Date limite de réception de demande de communication
(1/2 page en français ou anglais)
le 2 Mars 1996

A envoyer à :
Professeur Jean-Claude Abric
Université de Provence - Laboratoire de Psychologie Sociale
29 ave. R. Schumann
13621 Aix-en-Provence Cedex 1
Tél (33) 42 95 38 12 - 42 20 74 81 - 42 95 38 17
Fax (33) 42 95 74 81 - 42 20 59 05

Des informations pratiques complémentaires seront envoyées début janvier 1996.

This recom is *coded* in French on a paper *media*, and includes the following *(representational)* elements : the date of a conference (September 27 to 30, 1996), the location (Aix en Provence), the deadline for submission (half a page, in French or English, due March 2, 1996) ; the submission

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[5] Otherwise we would -and this is not feasible in this short paper- have to explain all the background of life at work in EDF Research Division or La Poste Headquarters, which were our actual research fields.

address with fax and telephone ; it comes with a response coupon, the fee, and a tentative programme. The recom has been emitted as a *warning* by Pr. Abric's secretariat. This recom *institutes* a state-of-things-to-be ("ST2B"). It provides Albert (one of the many addressees who *acquire* the recom) the representation of this possible meeting.

interpretation :

Albert constructs in his mind his own representation of the ST2B by mobilising his previous representations of the various elements present in the recom, of which some are social representations ("a conference", "social psychology", "Aix-en-Provence"...), and some are idiosyncratic representations (Pr. Abric as known by Albert, memories of the 2nd Conference last year, etc.). In doing so, *because he has the appropriate code and reference library -the representations-*, Albert unfolds the recom into implicatures [Sperber & Wilson, 1986] and develops a much richer and informative representation than the few signs on the paper seemed to convey at first sight. The first act of the drama is set : the representation of a ST2B has propagated from the Conference organising committee to one of the potential actors (and, in fact, to hundreds of potential actors because the same scene that takes place in Albert's office also happens in the offices of all of the addressees of the announcement).

Albert considers the representation, and takes decisions about his possible contribution to the realisation of this ST2B, by including various elements of his own context : does he have the time and resources, etc. Eventually, he will check a few other elements (just as our subject quoted earlier does with his messages). He applies the *incoming recom processing cycle*.
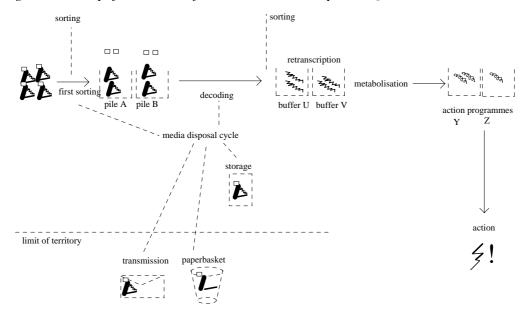
1. He re-transcribes various elements on his agenda for 1996. Page March 2 : *«deadline abstract Aix"*. Pages September 27 to 30 : *«Conf. R. S. Aix»*. Those are mere re-transcriptions.

2. Page February 5 : «write abstract paper Aix RS». This is the result of a computation, because Albert knows it will take some time to find the time to write the abstract, so he sets a date way in advance [Berry, 1994].

3. By processing his representations of Aix, Conference etc. He creates another recom, a memo for his secretary, which he staples with the announcement : *«I will go there, please send subscription and book hotel & tickets»*.

4. Makes a photocopy of the Announcement and stores it in a cardboard file labelled "Future congresses"

In doing so, he has :

1. Transformed the representation of ST2B into action scripts (« send abstract », « go to conference »).

2. "Metabolised" the information by planning a sub-task (« write abstract ») ; which unfolds from the situated decoding of the recom.

3. Metabolised the information by creating and launching co-ordinated sub-tasks that will be dispatched to other actors (secretary).

4. Created in his office environment an overt (paper file) representation of an external object (the Conference) that is pertinent for his activity.

The recom has been "metabolised" into modifications of the workcell.

Figure 5 : A simplified schema of the "metabolisation" process [Fischler & Lahlou, 1995]

As clearly appears, recoms, especially in their stable form of papers or files, are local *inscriptions* of parts of the representation of a state-of-things. As already noted by Norman [1993], these objects localised in the world tend to move or disappear less; therefore they can play the role of an external memory, less fragile than human memory. Which is shown by their role of reminders of actions-to-do. In this perspective, the actor's environment can be seen as an overt, stable, storage space for recoms. In the course of action, the actor uses this context or setting as a resource ; he extracts the pertinent representational elements as an input for his computations, in combination with other inputs ("internal" representations, incoming recoms ...).

6. Recom co-ordination

Another phenomenon that appears and is crucial to our point here is that inscriptions play a key role in representation dissemination and actor co-ordination.

To enlighten this point, let us come back to our example of the Conference announcement. Once all the addressees of the announcement have received their own recom in the mail, each one will "manage" to play his own part in the realisation of the global scenario. All those individual plays will, if all goes well, finally lead to the collective emergence of the ST2B (here, the Conference).

The single representation of the ST2B coded in the recom (the announcement) has generated numerous locally adapted scripts. This with a potency far beyond what a precise plan could have done.

Indeed, suppose that the Conference committee had proceeded in another way, by breaking down the making of the Conference into small tasks, then had given detailed instructions to each actor. Albert would have received a huge instruction book, one of which chapters would have been titled "Getting there", and starting more or less like that : *"On October 26th, in the evening, take your suitcase (refer to chapter 9 "making your suitcase") and your raincoat (ref. chap. 26 : "how to dress"). Open the door (see glossary) of your apartment and step out (ref. chap. 6 ("basic bodily movements") section 8.2.4.2.9 : « advanced combinations involving doors »). Go down the stairs of your house (ref. chap. 138 : "how to use buildings") and walk to the metro (ref. chap. 22 : "transportation" and annex LV: "map of Paris"). Go to the Gare de Lyon train station. There, find the appropriate train to Aix (see annex XI : map of France ; ref. chap. 22 and annex XXXIV : French railway schedules"). Get in the train ...* etc.

And each of those chapters would have to send back to (classical) references like *"How to read a railway schedule"*, then *"How to read books"*, *"Time and its measurement"*, then *"How to move your arm and grasp a book"* etc.

No need to insist : the emergence of the Conference is the result of a million local tasks that have to be performed by the actors. Each actor will act differently (everybody's instruction book would be different). And the detail of action, being a complex sensori-motor script adapted to the context, is far too complex a problem to be forecasted and solved in every occurrence by the organising committee. In a way, this is subsidiarity.

Still, all those individual scripts are coherent with the global representation of the ST2B. Provided that the announcement has been sent to a relevant population of addressees, all these local scripts will sum up harmoniously into realising all the constituting elements of the ST2B. (Of course, this never occurs for complex events, and an extra co-ordination structure is needed to check everything goes according to plans, and will give individual actors some feed-back. But this is the principle.)

7. The magic that stands behind recoms

So, a single, small recom like the announcement managed to generate such a complex co-ordination. How ? Because of *social representations*. The content of the recom is, potentially, *for a recipient who shares the code*, a representation of a ST2B. Each actor decodes it in his own pragmatic perspective. The amount of knowledge and potential scripts contained in the message is much larger than it seems. The decoding of the message creates a representation very large and complex, since every element in the recom triggers a full representation already existing in the recipient workcell. For instance, the location of Aix ("annex XI "map of France") is already present in the subject's mind. This is true of most references needed for decoding the recom. Most of this is included in what Norman [1972, p. 9] calls the subject's «knowledge of the world» :

> "When concepts are represented within memory they must fit within the framework provided by the knowledge of the world. This general world knowledge is likely to be extremely extensive, containing all the learned information that we have come to take for granted. (...) One view of the role of world knowledge is to consider it as a structural framework upon which newly acquired information must be fastened. This skeletal or schematic representation then guides both the interpretation of information and also the search for new information to fill the gaps left in the structure "

What is not readily available in the subject's mental equipment (Norman's « knowledge of the world », which we social psychologists would probably call social representations) is usually available somewhere in his environment in the form of artefacts or recoms : a map, a colleague who knows, etc.

As Shannon and Weaver [1948] noted, the signal is conventional : if it is agreed that the sign "X" will mean "King George's Bible", transmitting this single sign will have an equivalent result to transmitting the whole book. That's what we do when we transmit representations through language : each word refers to an existing representational pattern in the recipient. As the recipient decodes it, the message unfolds into an internal simulation (something like Minsky's *simulus*) of what it conventionally represents.

The very possibility of transmitting "information" through conventional signs presupposes that the addressee has, available, the necessary knowledge to decode and unfold the signal. This sends us back to the questions of common knowledge [Dupuy, 1992 : 49-95][6], relevance [Sperber & Wilson, 1986],

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[6] Specularity is "the mental act by which a human mind takes the perspective of another" and degree of specularity is "in a situation where this act [of specularity] is repeated a number of times, the number of successive embeddings "I think that you think he thinks..." minus one. Any finite specularity marks a certain

conversational logic [Grice, 1975] and semiotics in general. What we want to venture here is that these questions are only different formulations of the social representations problematics. The whole system works because it includes, already installed in the recipients, conventions : a reference system capable of generating relevant responses.

The recom doesn't "contain" all the instructions. It triggers the emergence of the ST2B by :

a) stimulating the reference system to reconstruct locally an action plan for each actor ;

b) using the local action resources.

Co-ordination of action is made possible by :

1) representability - the representation of the ST2B can be coded into a simple and economic recom, e.g. by symbolic language; and transmitted to destinators;

2) specularity - the coding system (including the reference system) is shared by the actors ;

3) generativeness - each actor will be able to reconstruct a richer representation of the ST2B from the recom by :

       -a) unfolding each element of the recom into a personal element of representation

       -b) arranging these elements together into a personal representation of the ST2B

4) good will - each actor then tries to reify 'his' part of the ST2B.

Co-ordination is made efficient because each workcell locally adapts its own scripts to the actual local context.

In the course of action, social representations appear as the bricks with which the subjects will produce the master plan of what is expected (here, by the Conference committee) to emerge collectively. Social representations are the specular reference system. General representations are specified by other representations, so that the ST2B is not a fuzzy or general object, but can be very precisely specified. E.g. : this is not *a* Conference, but *the 3rd* Conference *on Social Representations, in Aix, etc*.

7.1 Wild representations are procedural

Representations guide, shape, form action. They are cognitive artefacts that are also decision and instruction tools : a World users' manual. As a description of what something *is supposed to be*, or *supposed to be made*, they hereby give instructions of *what to do* to realise that something. Hereby, they are procedural representations, that can be interpreted into action, in the same way some computer languages imbed procedures within the representation (e.g. : GO TO (...) / PRINT (...) / STOP).

> "This method of imbedding procedures within the representation really means that the representational format for the knowledge in the representation (the data) and for the procedures (the programs) that operate upon the knowledge have the same format. (...) This means that the same information structure can be viewed as either data (declarative) or program (procedural) - and that is the key to this method of procedural representation." [Rumelhart & Norman, 1983, p. 80].

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degree of opacity, some deficit of reflexivity".[Dupuy, 1192, p. 68] Common Knowledge is of infinite specularity. "Intuitively, a proposition P in a community of knowing subjects is CK [Common Knowledge] if : 1) it is true ; 2) it is known of everyone ; 3) everyone knows the others know it ; 4) everyone knows that everyone knows that the others know it etc. Ad infinitum." [Dupuy, 1192, p. 68, mediocre translation by SL]

This is another -cognitive- way of expressing that old social psychology classic that "representation is at the same time pattern and process". As we have shown, social representations, in the wild, indeed imbed such procedural nodes that can be interpreted as motor action in the outer world (e.g. : "acquire", "warn" supra ; or "take" in the representation of "eating" [Lahlou, 1995a]). We suspect that all social representations, as observed in the wild, are procedural by nature. But this remains to be proved.

In our example here : an abstract is « a short paper in which the full-length paper is described and abbreviated »[7]. So, the author, when having to prepare his abstract, will just have to articulate the basic nuclei of the representation of « an abstract » and apply (act out) them to his own case, by modifying only those marginal elements that need to be adapted to his context [Lahlou, 1995a : 318-320]. Those adaptations of representation to the context might mostly concern, as in the cases noted by Moliner [1992, p. 325] peripheral nuclei of the representation, but they might in our view involve any elements.

7.2 Specularity saves volume

In using social representations as the common code between the emitter and the receiver, a tremendous economy of signal is achieved : only the relevant details and the general schemata are transmitted instead of transmitting a whole detailed representation of the ST2B. There is no need to transmit the description of the frameworks : they are already referenced in the addressee's 'knowledge of the world'. Only the reference code (e. g. the name of the reference) needs to be sent, with some marginal specifications.

Two technical applications of the same system will crudely show its interest. The first one is the updating of data bases. Usually, only the modifications are transmitted, the whole data base doesn't need to be re-copied.

The second comes from a satellite telecommunications company involved in mobile phones ; which also provides ground transportation firms cheap radio access to any truck in their fleet, wherever they are on the road within the U.S.. Messages are radio-cast by satellites to destinators (trucks). The company noticed that actual messages were very stereotyped[8] (e.g. : « To Daniel Boone, Truck n° 12, Friday June 23rd, 7:00 AM: Go to Philadelphia, please load a cargo of frozen doughnuts, at FRIO (Glenside), and bring it to Pittsburgh before tomorrow noon. Take care. Molly, central control», or « Please call at this number Mr. So-and-so », etc. Some messages are pretty long but involve very few variable segments. The solution adopted was to send « macro-instructions ». That is, the reference of a stereotyped message frame, and then the variable elements that complete it. E. g. the first message would become something like : « ref. N°25 / Philadelphia / frozen foods / FRIO (Glenside) / Pittsburgh / 29 h », where only the pertinent variables are specified, and « N°25 » refers to the type of macro-instruction (the framework representation) where the driver has to pick up some cargo and bring it to another location. The local terminal in the truck draws the referenced frame from its local data base and spells a nice full reconstituted message on the terminal screen, by filling, with the variables (Philadelphia etc.), the blanks in a pre-programmed frame. Much less than what appears on the screen has explicitly been transmitted. This economy is possible because the central control knows that the truck terminal shares the representation of the macro-instructions (specularity). This type of coding is very common in computer science.

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[7] The social representation of what a good abstract is probably richer : it must be teasing so that the paper is selected, provide the good references, have an exciting title, fit well into one of the workshops etc. We have no empirical data to describe what the social representation of a good abstract is ; this is just a fictitious example.

[8] The examples given are totally fictitious and coined for demonstration purposes.

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In this respect, we notice that the social representation system is an elegant way of saving volume in communications. Instead of transporting the whole picture, only the instructions to build it are transmitted. The recipient will use his own local resources (knowledge of the world) to actualise the representation locally, using the pattern and instructions transmitted through the recom.

7.3 The ready-made and the do-it-yourself

In the general model, the recipient, confronted with an incoming recom, will try to understand it, that is set it into the framework of reference constituted by his « knowledge of the world », which is made of representations. Most of the time, the recom is coded by referring to patterns, schemata, scripts, that the sender knows are shared by the recipient : « social representations ». That is, to quote Jodelet again : "a kind of knowledge, socially constructed and shared, having pragmatic purpose and contributing to build a common reality for the community" [Jodelet, 1989]. For communication, social representations are the implicit reference code in a given culture[9].

In the receiver of recoms, social representations act as the « schemata » of Rumelhart & Norman :

> "We view a schema as a general model of a situation. (...) The act of comprehension can be understood as the selection of appropriate configuration of schemata to account for the situation. (...) The schema that will be selected will determine the interpretation of the situation and will direct processing attention to selected aspects of the situation. (...) Perhaps the best way to view this is to think of all the data written on a blackboard, with the schemata examining the blackboard for data relevant to themselves. When a schema sees something, it attempts to integrate the data into its organizational structure, and the puts new information onto the blackboard. Other schemata might react to these new data. Thus schemata are data driven in the sense that they respond to the existence of relevant data. Schemata perform conceptually driven guidance to the processing by using their internal conceptualizations to add new data to the blackboard, thereby guiding the processing of other schemata" [Rumelhart, & Norman, 1976, pp. 10-12]

In our case, the "situation" is a ST represented in a recom.

As we said, those representations are more than a communication code. They encrypt action scripts for the realisation (reification) of states-of-things. Because their description of objects is usually a constructive one. In this respect, social representations are mental computing tools. They are so because they are cultural artefacts, which cumulate the pragmatic knowledge of generations. They are tools that provide solutions, or at least guidelines, for everyday problem solving (how to use a door, how to take the train, how to make a good paper for a Conference...). There is a French term for that : « pensée toute faite » (ready-made thought). As we have seen, this ready-made thought is more or less a toolbox of standard elements or patterns ; which are locally customized and/or assembled into locally adapted patterns ; so the final result is a combination of ready-made and do-it-yourself.

7.4 Information artifacts and social representations

The existence of such tools guiding action has been pointed at by cognitive scientists. For instance, Hutchins (1987) comes up with the concept of *mediation* :

> "Mediation refers to a particular mode of organizing behavior with respect to some task by achieving coordination with a mediating structure that is not itself inherent in the domain of the task. That is, in a mediated performance, the actor does not simply coordinate with the task environment, instead, the actor coordinates with something else as well, something that provides

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[9] Of course, subcultures (e.g. technical) can have their own glossary of shared representations.

structure that can be used to shape the actor's behavior. [p. 1] (..) Language, cultural knowledge, mental models, arithmetic procedures, and rules of logic are all mediating structures too. So are traffic lights, supermarket layouts, and the contexts we arrange for each other's behaviors. Mediating structures can be embodied in artifacts, in ideas, in systems of social interaction, or in all of these at once." [p. 10].

We have also seen the stress put by Norman on "schemata". Theories all point at the idea that there must be some « macro-instructions », some cognitive references, guiding the actors. **We have just suggested here that a crucial feature of such cognitive references is that they must be *shared* by the actors. And that sharing must be obvious (meaning : no participant questions the fact they are shared) ; this means specularity.**

There has been recently a major focus research on material artifacts as co-ordinating tools. They are indeed very important. Sometimes, artifacts hold more than could fit in a social representation, like the nautical charts described by Hutchins [1995 : 55-65]. But they must be considered in complementarity with *mental* artifacts : representations.

Let us summarise :

- co-ordination, as it needs communication, must rely on shared references to build in each performer the representation of the ST2B, and the fact they are shared must be known by all actors ;

- the action is locally planned by performers, using the representation of ST2B as a master plan out of which they unfold what is relevant to their own part ;

- the efficiency of co-ordination comes from the fact that local scripts are locally adapted by the performers, taking the constraints of their local context into account.

The reference system must be shared, specularly, pragmatically oriented with a cognitive aspect (pattern recognition), and a constructive aspect (articulable into action scripts). This looks very much like the classical properties of social representations. May be co-ordination is one of the ecological finalities that contributed to give them those properties.

8. Culture is a blackboard

Anyway, what appears here is that social representations are the mental version of overt representations. They are the "internalised" functional equivalent of material objects that are present and accessible in the common setting of participants to a task ("public objects"). The co-ordinating quality of those public objects (e. g. a map) is that they are available and shared *referents* ("thing meant"). Hence, they can be inserted unambiguously in every participant's computations just by pointing at them. For instance, an office worker could point at a telephone set and tell the technician : "plug it [pointing at the phone] in here [pointing at a plug], not in this one [pointing at other] it is for the fax".

Adequate co-ordination badly needs such unambiguous agreement on referents, and on what is to be done with them. What social representations allow is making the referents available to all in an ubiquitous way, so that actors and objects can co-ordinate without standing in the same geographic or temporal space. For instance, the office worker (« Albert ») could send a mail to the telephone utility, stating « Please come and install a telephone and a fax (standard model) for me. My office is n°112 in building Y, and please connect the phone on the plug below the window and the fax on the other one ». Then the technician will be able to execute the task even if Albert is not present. The technician

will locate the proper elements because he shares the general reference system, and because local specifications were provided in the recom, referring to local contextual clues publicly available in the setting.

Social representations stand in a virtual space, accessible by all members of the group. In this perspective, *Culture,* as the storehouse of social representations*,* can be considered as a group's common, and virtual, blackboard, where social representations are inscribed.

In this respect, shared referential systems (language is one, where social representations are the shared referents of « words ») *connect the various individual universes into a global setting in which indexicality becomes possible in the absence of material referents.*

Indexicality is of course a crucial condition for co-ordination.

9. The EDF phone list and other paradoxes

An amazing feature of this referential system of representations is that it need not exactly map to a «material » referent.

Let us take two examples. The first is the Conference again. Before September 26th, the Conference cannot be said to exist in reality : it is not observable. And after the 30th, it does not exist any more : only remain scattered memories, and some artefacts (proceedings...). From the 26th to the 30th, what can be observed is only a set of partial views. No such phenomenon as described by the announcement or its local representations in participants can be said to occur exactly according to the plan (absent speakers, last minute changes in workshops etc.), even if the general feature corresponds to it. Strictly speaking, the Conference of which the announcement was a representation never existed. *Something* happened, for sure, but not *exactly* what was planned. And exactly *what* was the Conference is a phenomenon inaccessible to global observation.

The Conference is an emergent phenomenon that *bootstrapped* from its representation, in the sense that, as legend has it, the Baron of Munchhaüsen took off in the air by pulling his bootstraps [Raspe, 1785]. But the phenomenon emerged from a representation *of what* ? This question has no clear answer.

What is the status of the representation of the Conference that was mailed with the announcement ? Before the 26th of September, it is the representation of something that might exist in the future, the representation of a fiction, a possibility. After the 30th, we can state that it is a representation of something that never existed, even if a phenomenon that is closely linked to this representation indeed occurred between the 26th and 30th of September. This representation has no unambiguous referent : when observed, the-phenomenon-that-the-representation-is-supposed-to-refer-to does not exactly fit with the representation. The ST2B is a fictitious referent, which changes progressively as the dates of the Conference approach, and is monitored by the conference committee and the actors to get close to the target -and all actors do not agree on everything. Both the master plan and the local plans are adapted, just like the Seldon plan in the hands of the Second Foundation in Isaac Asimov's science fiction novel. This view supports the controversed position [Wagner 1996 ; Lahlou 1995a] that representation is no representation "of something".

To use another metaphor, which Russel [1956, p. 5] mapped to the problem of knowledge : "(...) a traveller approaching a mountain through a haze : at first only certain large features are discernible, and even they have indistinct boundaries, but gradually more details become visible and edges become sharper". Only that, as you get close and details are revealed, the global shape is no more visible and only remains as a mental framework.

One could even say that « the 3rd Conference » existed as such only as a social representation. As we saw, any other attempt to describe the phenomenon in a less fuzzy manner yields not « one object »,

but only partial glimpses of something larger that is supposed to exist beyond observation : « the 3rd Conference », which something will forever stay a theoretical fiction.

Still, in our case, it worked well as a representation should : it enabled co-ordination, and provoked the emergence of a phenomenon. Language provided a transient support for stabilising the referent as an object. This lexical object («The 3rd International Conference on Social Representations»), can be transmitted and manipulated, although what it stands for is unclear.

We forward here the idea that it is precisely because words are fuzzy that language can play the role of a global reference system. If words were *very accurately* referring to definite objects, the actors would not find those *very* definite objects in their setting. E.g. it is pragmatic to say « Please come and install a telephone» ; but it would not be efficient to replace "telephone" by a precise physical tridimensional description "T" of a telephone, specifying every atom. For such an accurately defined object probably does not exist in the technician's environment : the available telephone set in the technician's storehouse might differ from "T" by the position of one molecule ; and so the technician would not recognise it as a relevant instance of "T". This may sound exaggerated. But suppose that the technician is a robot, comparing "T", pixel by pixel, with its sight of its environment in order to find a match ?

Another case will exemplify the problem of fictitious referents. EDF, the French electric utility, has a staff of around 118 000. There is a computerised phone list ("Athena"), stating addresses and positions of all agents, accessible by Minitel (telematics), and which can even be updated by the agents themselves. This list can be said to be a representation of the staff. Experience shows that this telephone list is never accurate, because sometimes you just can't find in the list a person, whom you know is member of the staff, but just moved. One could say that the representation is « false ». But of *what* is it a representation ? Changes in the EDF organisation chart take place every second, although no change is fully instantaneous (what day exactly is one supposed to have changed, when we know that many people still come back in their previous affectation for some time to settle things properly, that no moving can be done in a second etc.). By the time the representation has propagated to the observer, the source has changed ; and God knows what biases were introduced during propagation, and interpretation ? « EDF » is an ever-changing phenomenon. EDF as « a material object », beyond the phenomenon, is only a theoretical fiction, as its boundaries and properties depend upon the system of description used. Still, it can be represented.

So representations are fuzzy objects. They serve as referents for co-ordination, but they don't need to refer to much more than themselves to serve as co-ordination tools. They are landmarks for communication, out of which we weave a fabric of ST2B that sometimes emerge as phenomena. The theory of speculative "bubbles" in stock exchange [Orlean, 1990], is another beautiful example of phenomena emerging from co-ordination upon a reference which has no other role than crystallising co-ordination. Self-fulfilling prophecies and anticipation mechanisms in economy in general are of the same feather. It seems that this kind of bootstrapping, where reality emerges from possibility with the support of representations, is after all a very frequent mechanism.

10. Conclusion & perspectives

That some socially shared cognitive objects are a key feature in the course of action, and co-ordinated action even more, is becoming a commonplace thought in cognitive research (cf. supra Cicourel, Norman, Hutchins...) ; and also in some other fields : sociology [Latour, 1989], anthropology [Sperber, 1996], not to speak about linguistics... It seems that, starting from different grounds, researchers are converging to that same notion of social representations upon which our discipline has worked so much. The constructive and referential properties of social representations have, since the beginning, been described as one of their main features : Moscovici calls them referential instruments (« instruments référentiels ») serving as unconscious patterns for many everyday actions [*1961*, 1976, p. 172], and serving for creating reality [Moscovici, 1988b]. Although those properties have been

accepted and described for long in our discipline, they often are incompletely understood by parent disciplines because most of the objects we study are so "social" in the sense of societal. They appear as hazy mountains to the tourist from other disciplins who come across our field. Therefore our theoretical and methodological achievements do not propagate as much as they could, although they could enlighten the study of social phenomena at a smaller scale.

I believe further investigation of the detailed mechanism by which social representations are implemented *at low level in everyday actions* could bring us interesting theoretical perspectives. In this line of research, the fine approach and methods developed by the "situated cognition" researchers may be of great interest.

11. References :

ABRIC, Jean-Claude (1993). L'étude expérimentale des représentations sociales. In D. Jodelet (éd.) : Les *représentations sociales*. Paris : PUF, 3ème édition 1993. pp. 187-203.

ABRIC, Jean-Claude (1994a). L'organisation interne des représentations sociales : système central et système périphérique. In : C. Guimelli (éd.), *Structures et transformations des représentations sociales*. Neuchâtel : Delachaux et Niestlé, 1994. pp. 73-84.

ABRIC, Jean-Claude (1994b). Les représentations sociales : aspects théoriques. In J-C. Abric (éd.) : *Pratiques sociales et représentations*. Paris : P.U.F., 1994. pp. 11-35. ISBN 2 13045895 5.

BATESON, Gregory (1951). Information and codification : a philosophical approach. In J. Ruesh & G. Bateson : *Communication : The Social Matrix of Psychiatry*. New York : Norton, 1951. pp. 168-211.

BATESON, Gregory (1967). Style, grâce, information dans l'art primitif. In G. Bateson : *Vers une écologie de l'esprit,* Tome I. Paris : Seuil, 1977. Pp. 140-164.

BERRY, Michel. (1994). *The researcher's schedule. Making good use of deadlines and rituals*. Ecole de Paris, Séminaire du 4/3/1994. http://www.cri.ensmp.fr:80/ecopar/mb.html

CICOUREL, Aaron V. (1994). La connaissance distribuée dans le diagnostic médical. *Sociologie du Travail*, n°4/94. pp. 427-449.

CONEIN, Bernard, JACOPIN, Eric (1994). Action située et cognition. Le savoir en place. *Sociologie du Travail*, n°4/1994. pp. 475-500.

DUPUY, Jean-Pierre (1992). *Introduction aux sciences sociales. Logique des phénomènes collectifs.* Paris : Editions Marketing, Ecole Polytechnique, coll. Ellipse.

FISCHLER, Claude, LAHLOU, Saadi (1995). *Dossiers, piles d'attente et corbeilles. La digestion quotidienne de l'information dans l'entreprise*. EDF-Direction des Etudes et Recherches. HN 5195017. Octobre 1995. 48 p.

FLAMENT, Claude (1992). L'évocation de l'argent : une méthode pour la définition du noyau central d'une représentation. *Bulletin de Psychologie*, Tome **XLV**, n° 405, janvier-février 1992. pp. 203-209.

FLAMENT, Claude (1993). Structure et dynamique des représentations sociales. In D. Jodelet (éd.) : *Les représentations sociales*. Paris : PUF, 3ème édition 1993. pp. 204-219.

FLAMENT, Claude (1994). Aspects périphériques des représentations sociales. In C. Guimelli (éd.). : *Structures et transformations des représentations sociales*. Neuchâtel : Delachaux et Niestlé, 1994. pp. 85-118. ISBN 2 603 00945 1.

GUIMELLI, Christian (1994). Transformation des représentations sociales, pratiques nouvelles et schèmes cognitifs de base. In C. Guimelli (éd.) : *Structures et transformations des représentations sociales*. Neuchâtel : Delachaux et Niestlé, 1994. pp. 171-198.

GUIMELLI, Christian, ROUQUETTE, Michel-Louis (1992). Contribution du modèle associatif des schèmes cognitifs de base à l'analyse structurale des représentations sociales. *Bulletin de Psychologie*, Tome **XLV**, n° 405, janvier-février 1992. pp. 196-202.

HUTCHINS, Edwin (1987). Mediation and automation. University of California, San Diego. Institute for Cognitive Science. Report n° ICS-8704, Apr. 1987. 32 p. Published in *The Quarterly Newsletter of the Laboratory of Comparative Human Cognition*, 1986, 8, 47-58.

HUTCHINS, Edwin (1995). *Cognition in the wild*. Cambridge (Mass.) : M.I.T. Press.

HUTCHINS, Edwin.(1994) Comment le "cockpit" se souvient de ses vitesses. Sociologie du Travail, n°4/94. Pp. 451-473.

JODELET, Denise éd. (1989). Les représentations sociales. Paris, PUF, 3ème éd. 1993.

JODELET, Denise, OHANA, Jocelyne (1993). Bibliographie générale sur les représentations sociales. In : Denise Jodelet (éd.) Les représentations sociales. Paris : PUF, 3 ème éd., 1993.

LAHLOU, Saadi (1994). L'utilisation de l'information dans l'entreprise : quelques réflexions théoriques et une analyse lexicale. *Collection des Notes des Etudes et Recherches*, n° 95NO00022. Clamart : EDF. ISSN 1161-0603.

LAHLOU, Saadi (1995a). *Penser Manger. Les représentations sociales de l'alimentation*. Thèse de doctorat. Ecole des Hautes Etudes en Sciences Sociales. Paris, mars 1995. 739 p.

LAHLOU, Saadi (1995b). Vers une théorie de l'interprétation en analyse des données textuelles. JADT 1995. *3rd International Conference on Statistical Analysis of Textual Data*. S. Bolasco, L. Lebart, A. Salem (eds). CISU, Roma, 1995, Vol I, pp. 221-228.

LAHLOU, Saadi (1996a). A method to extract social representations from linguistic corpora. *Japanese Journal of Experimental Social Psychology*, 1996, 35, 3, pp. 278-291.

LAHLOU, Saadi (1996b). Experts, industriels, médias, consommateurs, institutions : comment les représentations des acteurs et le marché se co-construisent. In Ismène Giachetti (éd.) : *Identités des mangeurs, images des aliments.* 1996. Polytechnica. pp. 123-150.

LAHLOU, Saadi (1996c). The propagation of social representations. *Journal for the Theory of Social Behaviour*, Vol 26, n°2, June 1996. pp. 157-175.

LAHLOU, Saadi, FISCHLER, Claude (1996). Comment digérer les informations : le bureau surchargé. *Sciences Humaines*, n° 65, oct. 1996, pp. 42-45.

LATOUR, Bruno (1989). *La science en action*. Paris : La découverte, 1989.

MACKAY, D. M. (1972). Formal analysis of communicative processes. In. R. A. HINDE (ed.) : Non-Verbal Communication. Cambridge University Press. Cambridge, 1972. pp. 3-25.

MINSKY, Marvin (1985). *La société de l'esprit.* Paris : Interéditions, 1988.

MOLINER, Pascal (1992). Représentations sociales schèmes conditionnels et schèmes normatifs. *Bulletin de Psychologie*. Tome **XLV**, n° 405, janvier-février 1992. pp. 325-329.

MOLINER, Pascal (1994). Les méthodes de repérage et d'identification du noyau des représentations sociales. In C. Guimelli (éd.) : *Structures et transformations des représentations sociales*. Neuchâtel : Delachaux et Niestlé, 1994. pp. 199-232.

MOSCOVICI, Serge (1961). *La psychanalyse son image et son public*. Paris : PUF, 1976.

MOSCOVICI, Serge (1988b). Notes Towards a Description of Social Representations. *European Journal of Social Psychology,* Vol. 18. pp. 211-250.

NORMAN, Donald A. (1972). *Memory, Knowledge, and the answering of questions*. Center for Human Information Processing. University of California, San Diego. Chip 25, May 1962. 42 p.

NORMAN, Donald (1993). Les artefacts cognitifs. In *Raisons Pratiques*, 4, pp. 15-34.

ORLEAN, André (1990). Contagion mimétique et bulles spéculatives. In J. Cartelier (éd.) : *La formation des grandeurs économiques.* Paris : PUF, coll. Nouvelle Encyclopédie Diderot, 1990.

RASPE, Rudolf Erich (1785). Le Baron de Muncchaüsen. Paris : Nathan, 1979.

REINERT, Max (1983).- "Une méthode de classification descendante hiérarchique : applicatio n à l'analyse lexicale par contexte". - *Les cahiers de l'analyse des données*, Vol VIII, n° 2.

ROQUEPLO, Philippe (1990). Le savoir décalé. in : Technologies et symboliques de la communication. Colloque de Cerisy. Sous la direction de Lucien Sfez et Gilles Coutlée, avec la participation de Pierre Musso. Presses Universitaires de Grenoble. 1990. pp. 75-80.

ROUQUETTE, Michel-Louis (1994). Une classe de modèles pour l'analyse des relations entre cognèmes. In C. Guimelli, C. (éd.) : *Structures et transformations des représentations sociales*. Neuchâtel : Delachaux et Niestlé, 1994. pp. 153-170.

RUMELHART, David E., NORMAN, Donald A (1976). *Accretion, tuning and restructuring: three modes of learning*. Center for Human Information Processing. University of California, San Diego. Report no. 7602. August 1976. 31p.

RUMELHART, David E., NORMAN, Donald A (1983). *Representation in Memory*. Center for Human Information Processing. University of California, San Diego. Report no. ONR 8302. UCSD Chip 116. June 1983. 117 p.

RUSSEL, Bertrand (1956). Human Knowledge, its Scope and Limits. 3rd edition. London : George Allen & Unwin.

SHANNON, Claude E. , WEAVER, Warren (1948). *The Mathematical Theory of Communication*. Illini Books edition, University of Illinois Press, 1963.

SPERBER, Dan (1996). *La contagion des idées. Théorie naturaliste de la culture*. Paris : Odile Jacob, 1996. ISBN 2-7381-0322-9.

SPERBER, Dan, WILSON, Deirdre (1986). La pertinence : communication et cognition. Paris : Editions de Minuit, 1989.

WAGNER, Wolfgang (1996). Queries about social representations and construction. *Journal for the Theory of Social Behaviour,* 1996, 26, 95-120.

WHORF, Benjamen Lee (1956).- "On the Connection of Ideas". - in Language, Thought and Reality. John B. Caroll ed. The MIT Press, Cambridge, Massachussetts. 35-39.