

On Gardin's logicist analysis

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1) Introduction

I want to discuss in my paper certain aspects of Gardin's logicist analysis (1). My proposal is the following:

- 1) to sum up briefly the central claims of Gardin's approach;
- 2) to discuss his claims and to compare them with those of some other approaches in the cognitive sciences or discourse analysis.

2) The logicist analysis (summary)

a) According to Gardin and his research team, the central objective of the logicist analysis is the *reconstruction of scientific reasoning* in human sciences in general and in archeology in particular.

b) The objects or "facts" in which logicist analysis is interested are those *texts* which can be considered as written with the intention to describe and to explain either a certain problem or a certain empirical field in the humanities. Nevertheless the logicist analysis also applies, according to Gardin, to scientific reasoning in the humanities out of or beyond its textual supports, i.e. to scientific reasoning as a "*practice*" you can observe "in vivo" during, for example, the collection, comparison and classification of physical objects in archeology.

c) The *delimitation of the corpus of relevant texts* is given by the preliminary assumption that a scientific text refers to four typical components peculiar to scientific reasoning:

- i) the declaration of the *objectives* or *tasks* that should be fulfilled by a scientific investigation (Gardin mentions, for example, the delimitation of the empirical field of observation and application);
- ii) the *descriptions* of those phenomena that constitute the empirical field of a scientific investigation (the particular language of description is called by Gardin a "system of symbolic representations");
- iii) the expression of a *thesis* that constitutes, according to Gardin, the "raison d'être" of a scientific reasoning in the sense that it is either the "cause" of a descriptive activity or its "result";
- iv) the processes of *validation* that may determine the empirical "goodness" of a theoretical interpretation of descriptions.

d) Given this background, there are two central purposes in the logicist analysis:

- i) a *descriptive purpose*, viz. the intention to bring out the different "systems of representation" and their more or less explicit relations with the system of synthetic propositions (theses, theoretical or epistemological assumptions, and so on);
- ii) a *normative or ethical purpose*, viz. the intention to improve by concrete propositions our scientific constructions in the humanities.

e) The logicist analysis deliberately leaves out the preliminary elaboration of research-strategies (definition of a task, delimitation of an empirical field,...) and the ultimate processes of validation to take only into account the unfolding of scientific reasoning that may be observed as an **inferential-like process** linking the propositions of observation and their theoretical interpretation. The unfolding of scientific reasoning in human sciences follows a process characterized either as "bottom up" or as "top down" - two orientations that seem to be symmetrical in Gardin's theory.

f) In fact, the model representing the "architecture of scientific constructs" serves not only as a descriptive device in the logicist perspective, but also as an *organizational tool* with a view to the homogenization of interpretative procedures in the humanities (in this second sense, this model serves the normative purpose mentioned above).

g) Following Gardin, the model representing the architecture of scientific constructs bears a close analogy with the form of some expert systems in artificial intelligence. In fact, the schematization of arguments in logicist terms calls upon:

- * *particular and general propositions*, i.e. either propositions which establish a correspondence between the physical, linguistic, ... objects of description and the descriptive meta-language, or propositions that give an interpretation of these objects;
- * *inferential propositions*, i.e. propositions that introduce or reconstruct a relation of order between different particular or general propositions;
- * *different levels of (re)construction* that govern the strategies of demonstration used either for the justification of a certain theory on the basis of a chosen description of empirical objects or for the explication (explanation) of an established descriptive order concerning certain types of objects.

The principles that govern the elaboration of some expert systems seem in fact quite close to those that underly the logicist analysis. In expert systems, one can generally distinguish between:

- * the representation of *facts* by means of atomic expressions which may be compared with the particular and general propositions in logicist analysis;
- * the representation of *relations* or *rules* between facts by means of inferential expressions which may be compared to the inferential propositions in logicist analysis;
- * the existence of an automatic *problem solving* or *deduction system* which is prefigured in logicist analysis by the different levels of

reconstruction (Gardin mentions in this connection the two well-known strategies of back - tracking and for - tracking that are for him equivalent with the so-called inductive and deductive approaches to scientific rationalization.

When discussing affinities between logicist analysis and expert systems, Gardin mainly insists on two possible advantages of the latter, which offer us:

- i) simulation mechanisms for the "verification" of the internal consistency of scientific reasoning in human sciences;
- ii) firmer procedures for the elaboration of knowledge bases and strategies of problem-solving.

h) There is finally an important assumption made by Gardin, namely that the logicist analysis of scientific reasoning in human sciences is an epistemologically autonomous approach. The autonomy of the logicist analysis follows from its particular theoretical and operational perspective, that is the conceptual representation and computational simulation of descriptive and explanatory procedures in human sciences. In this respect, it differs from the different approaches of discourse-analysis in semiology, linguistics, pragmatics, and so on as well as from the philosophy of sciences and cognitive or genetical psychology.

3) The logicist analysis (discussion)

a) The logicist analysis and the internal consistency of (scientific) reasoning

If I have well understood Gardin's work there is a central claim that the system of propositions represented by a scientific discourse must possess an internal or logical consistency. The relative weakness, for example, of scientific reasoning in the humanities, compared to natural sciences, seems to be based on its "rhetorical character", its constructional opacity in establishing clear-cut rules between particular and general propositions.

I think that the internal consistency is only one necessary but not sufficient condition for scientific reasoning. You may easily meet this requirement and therefore produce a "good" scientific text or reasoning, even if your theory or explication is not at all recognized as empirically valid. Also literary, poetical or mythical discourses bear an internal consistency. Even more, one may wonder whether the requirement of internal consistency is not a kind of pre-condition of all kinds of discourse activity that wants at least to be intelligible.

I might be wrong, but I think that Popper's argument concerning the "game of science" is at this point valid. This game requires a "Methodenlehre", methodological rules; the rule of internal consistency is one but not the only one. In criticizing the "linguistic fallacy" of the Vienna circle, Popper emphasizes that the growth and the "goodness" of scientific knowledge in general and of a theoretical system in particular cannot be achieved solely by an analysis of the "language of science". Even if one excludes psychological and historical considerations on the perception of objects and its relations to theories, it seems too restrictive to evade, in favor of a pure analysis of the scientific language, the problem of the empirical status of descriptive propositions as well as

the explanatory value of general propositions and therefore the comparison between different competing theories:

"Auch wir halten zwar eine rein logische Analyse der Systeme - ... - für notwendig. Aber auf diese Weise können wir jene Eigentümlichkeit der empirischen Wissenschaft, die wir so hoch schätzen, nicht erfassen. Denn wer an einem System, und sei es noch so "wissenschaftlich", dogmatisch festhält (z.B. an der klassischen Mechanik), wer seine Aufgabe etwa darin sieht, ein System zu verteidigen, bis seine Unhaltbarkeit logisch zwingend *bewiesen* ist, der verfährt nicht als empirischer Forscher in unserem Sinne, denn ein logischer Beweis für die Unhaltbarkeit eines Systems kann ja nie erbracht werden, da man ja stets z.B. die experimentellen Ergebnisse als nicht zuverlässig bezeichnen oder etwa behaupten kann, der Widerspruch zwischen diesem und dem System sei nur ein scheinbarer und werde sich mit Hilfe neuer Einsichten beheben lassen. ... Kennzeichnet man also die empirische Wissenschaft nur durch formallogische Angaben über den Bau ihrer Sätze, so kann man jene verbreitete Form der "Metaphysik" nicht ausschließen, die ein veraltetes wissenschaftliches System zur unumstößlichen Wahrheit erhebt."(2)

I suppose that Gardin's epistemological position is quite near to that defended by Popper but I am not so convinced that the logicist analysis alone in its actual form could alone provide criteria of the scientific character of reasoning in the humanities.

There are two significant arguments that I have found in Gardin's most recent book and which are not necessarily compatible :

i) On the one hand there is this explicit limitation just mentioned: the logicist analysis takes into account only the internal structure of the system of descriptive propositions (the "symbolic representations" of empirically interesting objects) and its more or less explicit and consistent relationships with the general propositions (the hypotheses, theories, etc). The external validity of the latter are left out. It seems useful at this point to consider here the role and function of SUPERIKON, an expert system in archeology which compares different interpretations of a medieval stele in Anatolia. The greater probability that the stele represents scene A and not scene B or scene C depends merely on a "democratic" criterion, namely the fact that there are more specialists who prefer an interpretation of the stele according to the first

and not to the second or third solution. I doubt whether such an approach may clarify the empirical validity of competing explications. The sole fact that there already exists more than one categorizing judgements forces us, in my opinion, to take into account not only the expressed descriptive propositions but also the more or less implicit but not necessarily verbalized assumptions that orient a descriptive act. Therefore SUPERIKON needs, I think, a methodological rule not only for the special case of the quoted medieval stele but for all presumably equivalent problematic cases - a methodological rule that governs the heuristic research strategies for finding appropriate descriptive items related to a given hypothesis. At the same time, such a rule must be encompassed by another rule that formulates a criterion which enables us to decide if a perceptive item in the form of a descriptive proposition may or may not validate a given hypothesis, a theoretical assumption or an explicit theory in the form of a general proposition.

ii) On the other hand, Gardin himself broadens the logicist program to the dimensions of a "research project about reasoning", with the following list of problem areas:

**heuristic strategies* that give rise to the constitution of initial propositions that shape the empirical basis of inferential-like reasoning leading to theoretical interpretations;

**analogical reasoning* that seems to play a central role not only in the constitution of an empirical basis but also in the formation of theories;

**divergent inferences* given the same "background" or "cause";

**extension of the cognitive or conceptual fields* where the inferential-like processes disclosed by the logicist analysis are "applicable".

In formulating such a research project, we are necessarily leaving the restricted field of scientific reasoning that Gardin has assigned to the logicist analysis and are switching to the comparison between general human categorizing judgements and special ones like those in science, poetry, history, and so on.

This takes me to an other comment.

b) Logician analysis and the problem of conceptual inferences

According to the preliminary assumption that scientific texts display a certain variety of necessary components (see 2.c.), the logician analysis postulates that scientific reasoning is one and one only, that the different modes of knowledge acquisition, processing and validation which claim to possess the status of science have to satisfy some restrictive rules such as explicit internal consistency, empirical validity, predictability, etc. I am not a specialist in methodology and epistemology of scientific reasoning but it seems to me that the logician analysis then inevitably meets the problem of Popper's "Abgrenzungskriterium".

I wonder if the form and function of the conceptual scheme representing the "architecture of scientific reasoning" in logician terms doesn't depict essentially some typical properties of a certain kind of human knowledge processing in general. In other words: does it (the conceptual scheme) represent something that is peculiar to scientific reasoning in general or to scientific reasoning in the human sciences in particular ? I would rather emphasize that observation, comparison and classification of objects with a view to the construction or the validation of a certain theory are inherent to human categorization judgements in general and therefore not only to scientific reasoning, but also, for example, to common sense reasoning. I think that "stereotypes" or cultural conventions in general are similarly based upon a sort of theories that orient the relevance of descriptive and inferential-like processes.

It may be useful to reconsider here the classical *A Study of Thinking* of J.S. Bruner, J.J. Goodnow, and G.A. Austin (3). Many considerations

about the processes of categorization are quite equivalent to those exposed in the logicist analysis. In discussing some central mental operations of perception and conceptualization, the authors claim that categorization judgements are based upon tentative inferences, i.e. testing the relevance and validity of perceptive or epistemic items for a given expectancy, task, and so on.

There seems to exist at least four general procedures "by which people reassure themselves that their categorizations are "valid" ": 1)the recourse to an ultimate criterion (i.e. a "principle", a "maxim", a "value", ...); 2)testing the internal consistency of construction (sic!); 3)testing the consensual commitment; 4)testing the affective congruence (4). If we consider in a little more detail these four procedures (especially the first, third, and fourth), they presuppose, I think, a single notion binding them together on a same "cognitive" ground: it concerns the concept of *topos*, developed already by Aristotle, that occupies a central position in modern theories of argumentation (5). The *topos* represents, grosso modo, a kind of basic semantic value or again, in a more pragmatic terminology, an assumed basic experiential configuration (6) that not only orients the perception but also the conceptualization (the comprehension and memorization) of an empirical field. If we agree that human perception is above all based on *attention* and *expectancy* as regulative processes of discrimination between more or less relevant perceptive items in view of the *achievement*, *retention*, and *transformation* (7) of information, then it seems clear to me that the *topoi* constitute preliminary frames of reference for the "concept learning" and also for the testing of hypotheses, for the elaboration of implicit (cultural) theories, and so on.

One can suppose that the inferential-like processes represented in the schematizations of logicist analysis are determined and therefore

oriented by topoi, that means by more or less implicit doxastical assumptions that may or may not possess a shared consensual status. Space does not permit me to discuss here in detail the schematization that Gardin proposes to one of his own articles in archeology (8). I will therefore limit myself to one of the following inferences proposed, which I find quite significant:

[analogies B,M, numerous and specific] -----> [B copies M]

"B" stands for a set of potteries originating from Bactria, in Central Asia (a kingdom founded by the Greeks after Alexander's conquest, ca. 300 - 450 B.C.).

"M" stands for a comparable set of potteries originating from the Mediterranean area in the same period.

The observational items are types of plates, cups, ... in B and M that are similar to one another and that are produced in approximately the same time spans.

The task is, first, to recognize the existence of a relationship between B and M, and if so, to specify the kind of relationship that has to be postulated ? Then, what consequences can we draw from this special case for the general study of civilizations and their mutual influences ?

Gardin formulates the quoted inference in the terms of a procedural rule: "s'il existe dans la base de faits une entité nommée "analogie B-M" possédant entre autres attributs des "qualités" telles que "nombreuses" et "spécifiques", alors on est en droit de poser une entité nouvelle nommée "relation B-M" à laquelle on associera un attribut indiquant que la "nature" de la relation est un phénomène de "copie" (dans le sens implicite "B copie M")" (9).

This formulation points directly to the problem of the topoi in (presumably scientific) arguments because it renders explicit the

argumentative "legitimacy" of the transition from "analogies B-M" to "B copy M".

Besides the inferential orientation

* [analogies B-M] ---> [B copies M]

there are other, conceptually possible orientations as:

* [analogies B-M] ---> [M copies B]

* [analogies B-M] ---> [reciprocal dependency between A and B].

The preference for the first orientation can be explained by reference to a "background knowledge", i.e. doxastical assumptions, that permit one to select a certain interpretation among other possible ones. Naturally, such a "background knowledge" must not be considered as inflexible and perfect; on the contrary, it always stands open to criticism and negotiation by means of validation, discussion, and so on. We are, I think, touching here upon the central problem of the growth of scientific knowledge and its emergence out of prescientific, or - in a more general sense - cultural and practical knowledge.

Coming back to the quoted inference, I would therefore emphasize that the recognition of the existence of "background knowledge" or "topoi" as governing principles for the orientation of inferences may explain the "fragilité" mentioned by Gardin a propos of argumentative procedures in so-called scientific discourses. According to Gardin, the schematization of a scientific discours enables us "de découvrir les sauts qualitatifs auxquels nous sommes entraînés, que le caractère apparemment naturel de la rhétorique nous avait jusque là masqués. ... On pourra (...) se demander s'il est véritablement naturel de décrire les assertions (...) sous la forme proposée - "B copie M" - plutôt que sous la forme inverse - "M copie B" - , ... (10).

I would even argue that the topoi or background knowledge function, as I have already hinted, as "governing principles" for the description and

comparison of items as well as for the conceptual inferences. Therefore in this, their status is quite conform to that of "conventions" as it has been developed by D.Lewis (11), or again to the "conventional constraints" in Perry's and Barwise's semantics of situations and attitudes (12). In other words: the topoi as well as the conventional constraints function not only in a normative but also in a **constitutive** or **regulative** manner (cf. the von Wrightian problem concerning the foundation of normative statements like for example laws: a law not only possesses a "normative" content but also a "regulative" one (13); a topos similarly constitutes the specific "identity" of a certain class of propositions, but it can also be used in an ideological, doctrinal sense).

Coming back to the logicist schematisation of conceptual inferences in scientific discourse, I would say that the reformulation of a "discursive operation" (Gardin) of the form " $(P_i) \dashrightarrow (P_j)$ " in terms of the modus ponens "si p et si p \dashrightarrow q, alors q", is a methodological and even epistemological decision. In fact, the problem is the following: is it true that the conceptual inference represented by the discursive operation, is - as Gardin claims - a kind of "préfiguration de règles de raisonnement" peculiar to a logical inference processing system? In other words, should the "right" to infer (P_j) from (P_i) , be evaluated with reference to a logical constraint represented by the modus ponens or in reference to a conventional constraint represented by a certain topos ? Gardin pleads for the first possibility: "Le système expert est ... un moyen d'expérimenter nos argumentations naturelles, en "faisant comme si" les opérations qui les constituent impliquaient chacune l'existence d'une règle de réécriture $p \dashrightarrow q$ jusqu'alors informulée ..." (14). Gardin here seems to follow very strictly the claim of the neo-positivists concerning the internal or logical consistency of a scientific language and therefore of scientific argumentation in terms of tautological (analytical) judgements. But I think there might be a great difference between the conceptual inference in a discursive operation such as:

[Analogies B,M ...] ---> [B copie M]

and its meaning in a modus ponens form:

i) modus ponens : if there are analogies (...) between B and M, such that one copies the other (in this case, B copies M) then there is a relation between B and M.

ii) conceptual inference : if there are analogies between B and M, and given epistemical or doxastical assumptions about the meaning and function of those analogies related to a certain kind of objects in archeology, ancient technology etc., then *one might postulate, acknowledge, believe, argue, ...* that there is a dependency of B with regard to M.

The modus ponens formulates a purely analytical judgement, but, to me, this is not the case in the conceptual inference. In a conceptual inference, the judging subject always engages the credibility of his **decision** to categorize something in a certain way and not in another, at least logically possible one. Therefore, categorizing judgements in conceptual inferences can be submitted to empirical and inter-subjective controversies, i.e. to cognitive procedures that precisely permit changes and growths in scientific and - more generally - cultural knowledge.

Let me summarize:

i) in reducing a conceptual inference to a logical inference, or in considering the first as a kind of "prefiguration" of the second, you change its categorical status in the sense that you interpret it not as an empirical proposition but as a purely analytical one;

ii) consequently, a notion like "knowledge acquisition" can have several meanings and I doubt in fact whether there is any clear-cut idea of the process shared by computer scientists, psychologists, historians, linguists, and others.

c) The logicist analysis and the description of conceptual inferences

I want to conclude with some remarks concerning the descriptive task conferred to the logicist program.

As Gardin has stressed, the logicist analysis is mainly (and maybe exclusively) interested in the description and representation of reasoning processes in scientific discourse. In this, it diverges from the various global approaches in discourse analysis. In particular, the logicist analysis differs from structural semiotics or from the several cognitive approaches that try to elaborate conceptual models for the representation of integrated textual frames (15). But it differs also from the several theories of enunciation, rhetoric or again speech acts - theories that explore other problems related to human discourse activity in a different perspective. Finally, the logicist analysis deliberately leaves out the linguistic problems that have to be taken into account in the field of text generation and translation.

Given these remarks, two questions remain open:

- i) how can we define the position of logicist analysis as well as of its model for representing the architecture of scientific reasoning with reference to the concepts and tools of discourse analysis ?;
- ii) what are the possible links between the logicist analysis and other approaches of human discourse activity ?

Given the fact that the logicist analysis has an explicit theoretical reference model and given also the fact that this same model serves as an heuristic tool for the description of conceptual inferences between different kinds of propositions as well as as an organizational one for the "normalization" of scientific reasoning in the human sciences, there are, as I have already mentioned it, two different but maybe

complementary objectives: a descriptive one and a deontological or ethical one.

Gardin and his associates tend to drift sometimes from purely descriptive and representational goals to evaluative ones. That is, *eo ipso*, not particularly annoying; nevertheless, the status of the logicist model then changes from a cognitive or conceptual instrument to a regulative and even normative one. Incidentally, the question arises whether this model has all the virtues needed to become a kind of constitutive model in the humanities, bringing out the necessary and even sufficient conditions that determine the very "nature" of scientific reasoning. That is an epistemological and methodological problem which doesn't concern me here directly.

But what about the descriptive purpose of the logicist analysis? I think that we can consider its reference model as a kind of *canonical scheme* representing those components which may be postulated when dealing with cognitive processes like those concerned with the description and explication of empirical data as well as with the justification of hypotheses, theories, etc. However, such a canonical scheme is bound to be found in all discourses that follow similar cognitive processes. Therefore I think that the reference model of the logicist analysis constitutes in a certain sense the zero-unfolding, the most elementary level of the description of a certain kind of strategies in (scientific) reasoning.

In fact, Gardin himself insists on the necessity to refine the left side of the inferential operations in order to describe adequately scientific argumentation and to elicit its dependency on contextual specifications. The basic operation in this process is described as the addition of C-factors:

P_i and condition $C_1 \rightarrow P_{j-1}$

Pi and condition C2 ---> Pj-2
and so on.

The introduction of specifying conditions C1,C2, ... seems to take into account the argumentative topoi and assumed background knowledge, discussed above, that orient the cognitive processes of conception and categorization

Nevertheless, we have to distinguish neatly at least between conditions of reasoning which are "object-oriented" and those that are peculiar to the epistemic or doxastic assumptions of the subject. The first kind of conditions determines - following the terminology of Piaget (16) - the "accomodative capacity" of cognitive processes given the independent organization particular to the existence of a certain class of objects. The second kind of conditions determines - again following the terminology of Piaget - the "assimilative capacity" of reasoning processes given the particular organization of pre-existing knowledge, assumptions, beliefs, and so on that determine together the explorative attitude of the source of reasoning, i.e. of the subject.

This distinction, to me, is not only useful for descriptive purposes, but it is also relevant from an epistemological and even methodological viewpoint. The affirmation that there are epistemic or cognitive conditions that determine specific orientations in conceptual inference making processes introduces almost necessarily the *subject of reasoning* and furthermore the obligation to take into account its rationality, its credibility and responsibility with regard to existing rules or norms of the "goodness" of reasoning, and so on.

I think further that there is a clear opposition between, on the one hand, logicist analysis and a certain type of structuralism (especially in the version of Hjelmslev's glossematics), and on the other hand, more subject-oriented discourse analysis and pragma-linguistics.

Let me take an example from the field of cognitive linguistics. In this field one can easily distinguish between at least two quite different tendencies: the first, supported for example by R. Jackendoff (17), claims that there is a highly preformed conceptual categoriality that determines strongly the grammatical and lexical organization of a natural language; the second one, supported for example by R.Langacker (18), T.Givon (19) or again P.Hopper and S.Thompson (20), does not deny that there exist a conceptual level for the different grammatical functions and categories, but it emphasizes the prevalent role of discourse or communication activity in assigning a salient, i.e. a more or less prototypical position and function to linguistic categories. In this sense Jackendoff speaks, for example, of conceptual and grammatical well-formed rules, whereas Langacker, Givon, Hopper, and Thompson refer to notions like "convention" or "sanction" or again to general pragmatic principles of human communication in order to characterize different procedures of grammaticalization. These two tendencies have already led to two "schools" in European structuralism: the Danish glossematics with Hjelmslev or Toegby considering the Saussurian "langue" as an autonomous architecture of symbolic forms; the structuralism of Prague with Jakobson or Mukarcovsky claiming that the Saussurian "langue" is above all the product, the result of human communication and discourse activities.

The logicist analysis shares, in my opinion, the paradigm of the "computational mind" (21), i.e. the conviction that the human activities of conceptualization and categorization is a kind of a symbolic calculus, a kind of an "abstract machine" as suggested by the idea that "cognition is compilation".

This conviction also determines, I think, the choice not only to express conceptual inferences through the modus ponens but also to consider the restrictive conditions C_1, C_2, \dots of the inferential process $(P_i) \rightarrow (P_j)$ in quite the same manner as the two quoted (classes of) propositions

themselves. In other words, a specified or enriched form of the elementary conceptual inference (i.e. a form that contains C_1, C_2, \dots) seems to be only another kind of propositions P_i, P_j, \dots . If you adopt the other paradigm, viz. human activity of conceptualization and categorization as a matter of conventionality, co-operation, practical problem solving, and so on ... - a specified form of the same inference will more likely be described and represented as a two-level procedure: (first level:) given a certain background knowledge or given a certain epistemic or doxastic assumption (= C) about (P_i) and (P_j) (second level:) and given (P_i) then one (may/may not, must/must not,...) think, believe, recognize, ... that (P_j).

Coming back now to the canonical scheme proposed in the logicist analysis, I think that we have the choice between two research strategies: the first one aims at formulating analytical or tautological laws of reasoning, as it is done in epistemic logics; the second strives to describe and to explain the procedures of reasoning that one actually found in scientific or other texts.

If the latter way is preferred, then the logicist analysis as a descriptive instrument cannot elude the elicitation of background knowledge, topoi, conventional constraints, and so on, nor the question of the different types or strategies of conceptual inference making. In fact, there is a huge variety of specific acts that seem to play a central role in the form and function of a conceptual inference as well as in its specific unfolding. Let me mention only acts related to identification, description, comparison and evaluation of an object, or to the specification, generalization and abstraction of a certain class of objects, or again those involved in the no less enigmatic procedures of knowledge acquisition, etc.

I think that if the simulation of specific reasoning processes on computers is to improve their theoretical as well as practical value, we

must have at our disposal models or "grammars" that are able to represent those acts or actions in an operational way.

The elaboration of such models or "grammars" is, in my opinion, not only a matter of choosing a good formalism but also and maybe more a matter of empirical and descriptive investigations. On this level, there are many ways open to promote "co-operations" between the logician analysis and other approaches in discourse analysis in order to gain more insights into the organization of conceptual inferences that dominate reasoning processes in the human sciences.

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