



HAL
open science

The Arkeotek project : a european network of knowledge bases in the archaeology of techniques

Jean-Claude Gardin, Valentine Roux

► To cite this version:

Jean-Claude Gardin, Valentine Roux. The Arkeotek project : a european network of knowledge bases in the archaeology of techniques. *Archeologia e Calcolatori*, 2004, 15, pp.25-40. halshs-00004089

HAL Id: halshs-00004089

<https://shs.hal.science/halshs-00004089>

Submitted on 27 Jul 2017

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

I

SCRIVERE O RISCRIVERE L'ARCHEOLOGIA
TEORIA, TECNOLOGIA E SOCIETÀ DELL'INFORMAZIONE

WRITING OR REWRITING ARCHAEOLOGY
THEORY, TECHNOLOGY AND INFORMATION SOCIETY

THE ARKEOTEK PROJECT:
A EUROPEAN NETWORK OF KNOWLEDGE BASES
IN THE ARCHAEOLOGY OF TECHNIQUES

The web is rapidly becoming a major *transmission* tool. The Arkeotek project is closely bound up with it in matters of communication, but it emphasises another item of our agenda in this journal, namely the *representation and consolidation of knowledge* extracted from different sources in special areas of archaeological research. Let us first dwell a little on this distinction.

1. ON VARIOUS USES OF THE WEB

When discussing actual or potential uses of the web, one should distinguish the following categories of applications. (A) Most of them aim mainly at providing a broader and easier access to scattered information sources through their storage on one or several web sites. The emphasis is on the *communication* process itself and the modern technology which aims to improve it through the digitalisation of printed sources (texts, images, etc.). The progress achieved thus is enormous; but it is due for the most part to experts in computer science and technology, without much participation from scholars in the humanities except for some effort in mastering the proper software.

Category *B* includes the kind of computer applications that were innovative fifty years ago in the field of scientific information in general, and that have since become common in archaeology as elsewhere, e.g. retrieval-oriented data banks (bibliographic or factual), current awareness newsletters, etc. Their distinctive feature is a varying degree of reliance on linguistic or metalinguistic tools (indexing languages, thesauri, etc.) that are used in pre-editing the recorded sources and/or the requests addressed to them in natural language. A network component is often present in such applications, when the input of information or data is divided between different persons or institutions according to a scheme and a set of standards agreed by all participants in the network¹.

¹ A good example of such a network in the humanities is the ACHEMENET project launched recently by Pierre Briant (Collège de France, Paris). Its field of interest is the history of the Achaemenid empire that ruled over a large part of Western Asia between the 6th century B.C. and Alexander the Great's conquests at the end of the 4th century B.C. The mass of relevant sources, textual and archaeological, is enormous; its treatment calls for a variety of skills that are seldom found in the same person, whereas the number of scholars actively engaged in Achaemenid research throughout the world is relatively small. The case for a cooperative information network is therefore clear, especially since the population of potential users is inversely very large, given the impact of the Achaemenid empire on the fate of many peoples in the ancient world, from Greece and Egypt to India and Central Asia (<http://www.achemenet.com>).

The two categories of computer applications hitherto considered have no impact on the present form of archaeological publications, except for the occasional addition of tags or markers of various kinds to the original sources. In contrast, the major characteristic of category C is that the transition from paper to electronic support is associated with a reorganisation of the original texts, different from their usual presentation. The case for this reorganisation, however, is neither a consequence nor a requirement of computerisation; it precedes it, both logically and historically, as we shall recall shortly (§ 2).

A subsidiary but no less important characteristic of category C is that the network component is here a quasi-inevitable development of the proposed changes. In the long run, the restructuring of our modes of *publication* cannot be dissociated from a revision of *communication* patterns in the archaeological world. It logically leads to more advanced implementations of the principle of shared knowledge to which all scientists subscribe; the use of the web plays in that context a crucial role. The Arkeotek project is a product of this twofold perspective; let us first recall briefly the arguments developed over the years in its favour.

2. THE LOGICIST PROGRAMME: A REMINDER

The logicist programme is the name given to a long-term research project launched in the late '70s in France, with the support of CNRS (Centre national de la recherche scientifique) and EHESS (École des hautes études en sciences sociales), aimed at sharpening our understanding of the mechanisms and foundations of archaeological reasoning. It first proposed a method for bringing out the logico-semantic structure of interpretative constructs found in the archaeological literature, irrespective of their geo-linguistic origins or ideological affiliations. The principles and findings of this ongoing programme have been exposed many times (for the more recent progress reports, see GARDIN 2002 in French and 2003 in English); the following summary is merely meant to provide readers of this paper with the minimal knowledge needed to understand the purport of the Arkeotek project.

A. Archaeological theories are considered in the logicist approach as computational structures made up of the two following constituents: (a) a data base, *i.e.* a set of declarative propositions $\{P_o\}$ relating to objects or phenomena in the outer world, presented as descriptions of the material under study or introduced in the course of the argument to ground a particular inference; (b) an inference tree made up of rewrite formulas “(IF) p (THEN) q ” expressing the steps observed in written discourse as an author goes from one set of propositions $\{P_i\}$ (declared or previously established in the argument) to another set $\{P_j\}$. A bridge is thus established between the declarative propositions of the data base and the conclusions or hypotheses put forward by the author, through a succession of leaps from one or several levels of the inference tree to the next.

Such a tree can be designed or read in two alternative directions: empirico-inductive, from the data base {Po} to the conclusions {Pn}, or hypothetico-deductive, from the hypotheses {Pn} to the data base {Po}².

B. The primary objective of such reformulations is to express the logico-discursive structure of archaeological theories, from an epistemological viewpoint. No practical developments were initially envisaged: the adoption of a computational framework was not in our mind a warning sign of computer applications to come³. Yet, the condensation process inherent in logicist analyses did suggest alternative forms of publication: a whole chapter was devoted to the subject in our source book (GARDIN 1979-1980, chapter 6). Further, the homology later observed between logicist models and the format of knowledge bases in expert systems gave support to the idea that those models could be regarded as the core component of archaeological constructs from a cognitive viewpoint (GARDIN *et al.* 1987).

C. More examples followed to illustrate the possible rewriting of articles or (parts of) books as logicist models (ex.: BORGHETTI 1995; GARDIN 1998, 171-180). The recording of such models on an electronic support was announced in this journal as the next step (GARDIN 1999, 69-71), in connection with the work in progress of a team of archaeologists and experts in editorial computing under the guidance of Valentine Roux. The first publication of this team was purposely designed as an hybrid (ROUX 2000). Its most conspicuous part is a thick book (ca. 500 pages) devoted to the study of ancient beads from Bronze age sites of the Indus Valley and adjacent areas – a traditional publication, in which several authors present their respective findings about the meaning of those beads from different viewpoints: technology, division of labour, social stratification, economics, international trade, etc. The less visible part is a CD-ROM enclosed in the book, which means to express its cognitive substance (data and inference tree) in a 2-dimensional format inspired by logicist models; its goal is to meet the requirements of future consultants of the work, taking advantage of the navigational facilities of hypertext.

The juxtaposition of the two parts enables anyone to assess their equivalence in strictly cognitive terms.

D. “Consultants” of the CD-ROM are thus implicitly distinguished from “readers” of the book. The truth of the matter is that we have our own doubts as to whether books such as the one just described are likely to have many readers at all, in the true sense of the word. The reason is not only that much of the ar-

² This summary is itself a summary of the summaries given in the latest progress reports mentioned in the preceding footnote... For a more detailed account of the methodology, see the original presentation of the logicist programme (GARDIN 1979-1980).

³ For a largely similar framework inspired by the same epistemological concerns in another discipline, see CARTMILL 2002.

chaeological prose is indeed tough reading; more deeply, it is the consequence of a growing imbalance between the volume of works currently published in our respective fields of research, however “narrow” we humbly declare them to be, and the limited time available to acquaint ourselves with their content. This phenomenon has been stressed on many occasions, in the natural sciences as much as in the humanities; and most of us in archaeology seem to acknowledge it in private, despite brave attempts to dismiss the question by admitting that, “of course”, we do not read the larger part of those works but only skim through them when needed in relation to our particular interests, with any help we may get from indexes, abstracts and the like. In other words, we produce a literature in written form *as if* it were to be read, even though we are perfectly aware of the fact that its “users” are likely to act as ourselves, *i.e.* to consult it or parts of it according to their concerns of the moment. The implication is that a large part of our prose is at best unnecessary, or worse an obstacle to the requirements of scientific research. One of the goals of the logicist programme is to explore new forms of publication intended to get over that enduring inconsistency.

We should be helped in this by an imbalance of another sort, between the rising number of scholarly articles or books approved for publication by various juries and the limited budgets on which scientific publishers are expected to operate. Surely enough, the hybrid publication mentioned above (§ 2, C) did cost *more* to the publisher than the traditional book alone, for obvious reasons... But it was intended merely as a preparatory step towards the next phase of our publication programme described below, in which the part of the written text is considerably reduced (§ 3). Comparative estimates are as yet insufficient; but the general anticipation is that the financial straits of scientific publishers will eventually be much reduced in the process.

Let us however end this section on a less optimistic note, intended to convey the true dimension of the present issue. The following extract brings it out in so forceful terms that we feel no shame in citing it once more, rather than risking our own version of the modern “information crisis”⁴. The author is a distinguished physicist, Pierre Joliot, who lectures on cellular bioenergetics at the Collège de France in Paris. «Researchers have not waited for the development of communication networks to be swamped by a flood of publications which exceed their capacities of assimilation. Even if we limit ourselves to articles published in scientific journals, it has long been impossible to accumulate all the available information in one’s own domain [...] While the communication and information technology develops explosively, the capacities of our brain to acquire, store, assimilate and produce information remain unchanged [...] hence a growing inadequacy between those tech-

⁴ The matter is addressed more fully in our last progress report, quoting the same extract (GARDIN 2003, 5-6).

niques, more and more efficient, and man, whose biological characteristics remain stable» (JOLIOT 2001, 86-87). In other words, the crisis is essentially an ecological one, deeply linked – as most ecological issues raised in the last decades – to growth factors that we seem unable to control, including the most weighty and least discussed *demographic factor* implicit in P. Joliot’s argument⁵. The resistance of many in the humanities to the adaptative changes envisaged here is but a local aspect of this general inability (*infra*, § 5.5, 5.6).

3. POST-2000 TRENDS

A number of positive features have emerged in the last three years, in the wake of V. Roux’s “hybrid” publication, which led to the Arkeotek project.

A. A decisive factor was the support received from one of the major publishers in the human sciences, the Éditions de la Maison des Sciences de l’Homme in Paris. The historian Maurice Aymard, president of this institution, had initially taken the risk to allocate a substantial part of his budget to the publication of the work presented by V. ROUX *et al.* (2000), despite the lack of enthusiasm on the part of respectable advisers. He later agreed to go along with our next, more ambitious proposal concerning the creation of a new collection devoted to the same cause, namely the testing of new forms of multimedia publications. A number of potential authors were contacted, ready to undertake the rewriting of their unpublished theses in a logicist format with the help of the directors of the collection, Valentine Roux and Philippe Blasco. A private firm founded by the latter, “Épistèmes”, went into partnership with the Éditions de la Maison des Sciences de l’Homme for the purpose. The name chosen for the collection, “Référentiels”, picks out the major idea behind that project, from a conceptual viewpoint, which is to publish not only data *but also the reasoning processes* built upon them, in the hope that either or both will be used by researchers active in comparable fields of discourse.

The first volume in this collection came out last year (GELBERT 2003); it deals with a standard methodological problem in studies of ancient pottery, which may be summarised as follows. Archaeometric data are currently used in support of hypotheses about ancient techniques of pottery-making and their diffusion in various parts of the world; to what extent is it possible to strengthen such theories on the basis of ethnographical evidence [coming in this case from West Africa]? More precisely, among the various inferences $p \dots > q$ drawn by the author in her ethnoarchaeological construct, which ones would we be prepared to regard as potential rules of reasoning, whether “universal” or more likely context-dependent, local in this sense? And in the latter case, are

⁵ On the role of this factor in the major issues of our times, see the excellent analyses by Susan GEORGE (2000).

we able to specify in operational terms the characteristics of the “context” (or boundary conditions) that should be included in the premises *p* of such rules in order to legitimate their application in archaeology?

To be honest, tight discussions took place between A. Gelbert and the directors of the collection regarding the conversion of her thesis into a logicist construct and its transcription in the hypertext format devised by Ph. Blasco. However, the mutual benefits drawn from the exercise were acknowledged by all, as well as the utility of more debates of the same kind apropos of the next publications to come in the same series, on other subjects.

B. A second positive factor was the consensus reached by all parties – publishers, directors of the collection and prospective authors – about the editorial formula. It was agreed not to repeat the initial experiment by V. ROUX *et al.* (2000), combining a traditional book, unchanged, and its rewriting as a logicist construct on a CD-ROM. The CD-ROM should from now on be conceived as the core of the publication, intended for researchers alone, without any need to refer to the original material from which it was drawn (text and illustrations). But it was also agreed that a book was still needed, only much less voluminous than our usual publications – theses or others – and invested with functions of its own, other than those of the CD-ROM. Authors are invited to deal in their own style with any subject matter not explicitly covered in the CD-ROM, such as research objectives, state-of-the-art reviews, matters of strategy, methodological issues, personal narratives relevant to the research project, etc.

Ideas are likely to differ as to the relative weight that should be given to *circumstantial information* of that sort, in printed form, in addition to the *substantial knowledge* recorded on an electronic support. In fact, it may prove difficult for some time to prevent a misconception of the relation between the two parts, the tendency being to repeat in the book the argument articulated in the hypertext, while conceiving of the CD-ROM as essentially a relatively cheap way to store as many illustrations as possible, even if not directly relevant to the theoretical construct. The dividing line should come out more clearly in the long run, as the complementary but distinct functions of electronic and printed forms of publication become more widely understood and accepted (§ 5.4).

C. The launching of a collection implies on the part of its promoters a reasonable hope that there exists not only a “market” but also a number of potential authors willing to feed their own work into it, for some reason or other. A common one is the legitimate desire to take advantage of a possible outlet for unpublished material, the price to pay in this case being a readiness to invest some intellectual effort in the conversion process discussed above. This perspective alone, however, may act as a deterrent since researchers are mostly ill-prepared for that kind of task – an obstacle to which we shall return further on (§ 5.5). Another possible motivation is an inborn or acquired

fascination for computer processing in general; but this interest or skill does not necessarily go together with an aptitude for the kind of reflexivity that is here needed. A more interesting phenomenon in this connection is the fact that the theoretical issues highlighted over the years by the logicist programme seem now to be shared by a number of archaeologists in different institutions and countries; the Arkeotek project described below is a sign among others of this changing *Zeitgeist*.

D. A comparable evolution can be traced in the growing concern for matters of *practical epistemology* among scholars in the social sciences and the humanities. The word “practical” underlines a departure from the broader questions addressed over the years in philosophical circles in the name of epistemology. A more matter-of-fact approach is put forward, consisting of inquiries into the foundations of theoretical constructs in specialised fields of science, necessarily conducted by the researchers themselves rather than philosophers with no direct experience of such fields. A number of seminars have taken place in this direction from the '90s onwards, in which the logicist programme was amply discussed (summaries in GARDIN 2002, 21-24; 2003, 8-10). An additional reference should be mentioned, directly relevant to our present topic: a workshop was held in 2003 at the Maison des Sciences de l'Homme in Paris, on the invitation of its president Maurice Aymard, to confront the viewpoints of scholars interested in matters of practical epistemology in their respective disciplines, both in the natural and in the social sciences⁶.

4. THE EUROPEAN ASSOCIATION ARKEOTEK

The preceding pages provide the background from which the Arkeotek project took shape in the first years of this century. The following account is largely made up of extracts from documents distributed to members of the European association which took that name at the time of its creation in December 2002.

4.1 *The project*⁷

The objective of the association ARKEOTEK (European Association for the Archaeology of Techniques) is to create an infrastructure for the intensive sharing of research findings through the development of knowledge bases in

⁶ “Sciences de la nature et sciences de l'homme”, 18th november 2003, prepared by the sociologist Claude Grignon who had initiated a seminar of two years on that subject – a follow up in many ways of the one which he had previously organised on Models and Narratives (GRENIER *et al.* 2001).

⁷ The English version presented in this section is a translation by J.-C. Gardin of a text written in French by Valentine Roux.

the universe of discourse described as “the archaeology of techniques”. The focal point of this infrastructure is the site of the association on the Internet; it provides the instruments and the means of communication of the association.

The Arkeotek project does not aim simply at the digitalisation and networking of a set of texts related to the archaeology of techniques. The idea is not to establish an on-line library of electronic texts, accessible through a search engine working on keywords or full text. Electronic publications are here regarded as a working tool allowing a community of dispersed scholars to work in a cooperative and cumulative fashion and to publish the results of their research through a world wide network.

With this aim in view, the association Arkeotek publishes rewritten texts through a multimedia set-up that speeds up the assimilation of their logico-discursive structure and the consultation of the data bases which they mobilise. This editorial form follows the principle of Hypertext; it applies to the articles published in the electronic journal Arkeotek as well as to all the other texts published by the association.

4.2 The Hypertext principle

This hypertext principle is used for *research*, *publication* and *communication* activities related to works in the archaeology of techniques:

- a) a *research* hypertext because it aims at allowing all archaeologists to consult on the Internet theoretical constructs and the associated data banks in that field. It thus creates a proper structure for the organisation of knowledge bases and archives and for setting up in this way a shared networked laboratory in which researchers have a direct access to the primary sources of their work.
- b) A hypertext for *publication*: first, it provides an easy access to the scientific or cognitive content of texts, meeting thus some of the issues raised by the overproduction of scientific publications⁸. Second, it should help to reduce the technical and economic strains of publishing. The logicist reduction of texts in natural discourse leads to considerably shortened versions, while the multimedia support makes it possible to publish large quantities of data especially graphic, non-verbal data. The diminution of costs is also patent when it comes to translating those shortened versions in several languages.
- c) This kind of hypertext thus becomes a means of *communication* between researchers, far more rapid and powerful than printed books and journals published.

⁸ “Overproduction” in the sense earlier discussed, where this term refers to the imbalance between rising Production rates and fixed Consumption capacities (*supra*, § 2, D).

4.3 The SCD format

The Arkeotek activities can be edited in different formats. There exists at present one operational format, SCD (Scientific Constructs and Data), used first in the CD-ROM “Cornaline de l’Inde” (*supra*, § 3, A) and developed by the Éditions Épistèmes under Philippe Blasco. Priority is here given, from an ergonomic viewpoint, to speed of consultation and understanding of the interface as well as the minimisation of clicks. The logicist schematisations⁹ are consulted on four levels of reading, distributed among four screens.

- *1st screen. Overall structure.* The first screen presents, for each chapter or article, the successive stages followed by the author to reach his/her objective. These stages, or research plan, are properly speaking a guide on the chain of propositions that make up a scientific construct, indicating in thematic terms the set of propositions to be read in succession.
- *2nd screen. Quick reading of the results.* The second screen offers a quick reading of the different propositions established at each stage of the construction. It lists side by side the successive stages and for each one of them the successive propositions or strong points established. The information content of propositions varies according to the phase of the construction to which they belong. It can include:
 - a) circumstantial data, not central to the actual construct, but important for understanding the subject of the study;
 - b) descriptive data used in the scientific [cognitive] construct;
 - c) methodological principles;
 - d) results.
- *3rd screen. “Arguments”.* Each proposition is interactive and gives access to a third screen which explains it by adding a commentary, an illustration or a series of “arguments” listed on the left. The commentary is a paraphrase indicating the relevance of the various arguments cited in support of the proposition.

Arguments are of different sorts according to the content of the proposition which they support. In the case of a descriptive or methodological proposition, “arguments” are complements of information; whereas in the case of a proposition which introduces a result, “arguments” have a demonstrative function, inasmuch as they represent the data that have been brought in to infer the proposition. “Arguments” thus can be:

 - a) either a proposition previously established in the same construct;

⁹ Name given to the inferential trees mentioned above, §2, A. Schematisations are defined by the Swiss logician J.-B. Grize as follows: «models generated through a discourse in natural language» (GRIZE 1974, 204).

- b) or an inference rule taken from an actualist referential; on the basis of that rule, operations of various kinds (computations, attribute transfers) are carried out on the archaeological data, the results being given in the next arguments;
 - c) analytical results obtained from computations on the archaeological data.
- 4th screen. *Data series*. The fourth screen presents the data series brought into play by interactive arguments. A commentary in natural language describes the content of the argument. The multimedia presentation of data series has many advantages, both qualitative and quantitative:

Qualitative

- a) The illustration of the different arguments helps to grasp rapidly their semantic content. Thus, a series of images is an easy way to convey quickly the various shapes covered by a morphological typology of material objects. Or again, a series of diagrams helps to realise visually the results obtained from various computations.
- b) The documents (from which data series are extracted) can be of different kinds: texts, tables, graphics of all sorts, videos, animations, etc. – an important factor, given the diversity of documents used in the social sciences and the humanities.

Quantitative. The possibility of recording a large number of such documents is beneficial in three respects:

- a) First, epistemological: the analytical operations carried out in archaeological constructs often involve comparisons between series of data which we should be able to check, at least to a certain extent.
- b) Then, didactical: the initiation of students or researchers to the use of analytical tools is made easier when a sizeable number of documents can be produced and organised for the purpose.
- c) Lastly, archival: one should be able to keep track of the data series that have been used in a scientific construct. This requirement raises the delicate question of the role of the researcher in such a task; the idea here is an auto-archiving process in which the data series are provided and indexed by the authors of scientific constructs as a by-product of their work.

4.4 *Arkeotek publications on-line*

The publications envisaged in Arkeotek include:

- a) The Arkeotek journal, in which articles are modelled according to the SCD format; the editorial concept is described in the regulations of the journal. The launching of a new journal in archaeology – electronic or other – is today a risky venture, for widely known reasons. Moreover, it would seem to be at variance with the views expressed above regarding the “overpro-

duction” of scientific papers (§ 2, D). The argument for the Arkeotek journal is that it should function as a kind of funnelling device for collecting the building pieces of the Arkeotek network. Its functions is to publish the results of research in the archaeology of techniques, using actualist or other ways of exploration applied to a variety materials (stone, bone, pottery, textiles, shells, wood, etc.). The prehistorical and protohistorical periods are favoured, given the sizeable number of technological studies conducted for those periods; they make it possible to undertake from now on the consolidation of operational knowledge bases. The articles published in the Arkeotek journal are thus intended to provide the data and logical structures that will form the substance of the Arkeotek network of knowledge bases, expressed in the proper computer-oriented form.

- b) Knowledge bases designed according to the Hypertext Arkeotek and coming from various sources:
- articles in the Arkeotek journal;
 - monographs edited by European publishers according to the SCD format;
 - texts already published which the Association wishes to be rewritten according to its SCD format.

The Arkeotek journal and knowledge bases are multilingual. They will naturally be subject to the norms of copyright: their modalities in Arkeotek will be found on the Web site.

4.5 The Arkeotek workshops

The aim of the Arkeotek workshops is to propose and discuss modelling projects aiming at the development of operational knowledge bases in the archaeology of techniques. Those workshops are organised by members of the Association active in that domain. They can be held either on the Internet or physically. In the latter case, the workshops can take place in the various European institutions represented by members of the Association.

4.6 The site Arkeotek

The site Arkeotek is a technological platform where the Arkeotek publications mentioned above will be available (§ 4.4), as well as scientific information aimed at a cooperative network in the sense of both categories B and C of computer applications, see § 1. In particular, information about the statutes of the Association will be available on the site.

5. PROBLEMS, OBSTACLES

A broad variety of problems will have to be faced as the Arkeotek project develops. Some of them are already with us at this early stage and will have

to be met quickly. Others are more in the nature of obstacles that can only be overcome in the course of time, depending as they do on institutional and societal changes that are out of our control, much as we may wish to exert an influence on them. This final section is an attempt to list them in that order of increasing magnitude.

5.1 *Language problems*

In her call for contributions to this special issue, Paola Moscati pointed out that the problems of language and description standards that had filled the early literature in computing archaeology have «significantly come back into discussion in the light of today's consolidated diffusion of multimedia communication». The implication is that those problems should by now be well-known... Nothing will therefore be said about them in this paper, except to confirm that the usual tools of information science in matters of multilingual communication will be made available through the Arkeotek network as they take shape in connection with specific research projects.

Encoding concerns in the computer sense are sometimes included among the “language” issues; and there is indeed a tendency on the part of experts in computer science to bring together within a unique formal framework the design of “standards” in the broadest sense, including both the symbols used in research to make sense of empirical objects or phenomena and the symbols used in computing to handle the former in world wide, field-independent networks. This is not the place to go into this matter; let us however indicate in passing that the popular reference to “ontologies” in this context seems to introduce more confusion than clarity of purpose, to say the least.

5.2 *Software progress*

The SCD format designed by Philippe Blasco for Arkeotek has been described above as an adaptation of the logicist model (§ 4.3). The author insists that it is open to modifications according to the suggestions received from archaeologists who have experimented with it as users of the electronic publications expressed in that format – namely, the pilot work “Cornaline de l'Inde” described above (§ 2, C), the collection “Référentiels” (§ 3, A) and the Arkeotek publications to come. In fact, some adjustments have already been proposed; others are expected as a result of ergonomic studies presently under way¹⁰. Matters of presentation and manipulation are of primary importance in this period of transition from print to tape; no effort should

¹⁰ Ergonomic studies financed by CNRS (Cognitique/Programme Société de l'Information) under the direction of Pascal Salembier (Institut de Recherche Informatique et Technologique, CNRS, Toulouse).

be spared to make it as “natural” as possible in the eyes and hands of those who are expected to go willy-nilly through that evolution.

5.3 *Theoretico-archaeological concerns*

It may seem bizarre that concerns of that sort, which are the primary source of the logicist programme, should come third in our list. The reason is contained in a view again found in the announcement of this special issue: in order «to further debate and highlight some theoretical aspects of computing archaeology», we need to approach them «on the basis of current research projects» linked to the use of modern information and communication technology. The Arkeotek workshops mentioned above (§ 4.5) are in keeping with that strategy; the first ones, held in 2002 and 2003, have already proved fruitful in the perspective of theoretical archaeology. Many more should follow, depending on the progress of Arkeotek projects in the coming years, after the more practical problems recalled under § 5.1 and 5.2 have been addressed.

5.4 *The part of narrativity*

A persistently neglected aspect of the logicist programme has been our early emphasis on its limitations, especially with respect to the kind of public interested in its development. It was made clear from the outset that researchers alone were concerned (as in Paola Moscati’s announcement of this special issue). A further point consisted in taking up the case for literary versions of historical constructs in general, wholly or partly based on archaeological findings. Two reasons were put forward, the more obvious one being the mere existence of both authors and readers interested in that particular genre since a long time... A more stringent reason is the fact that professional historians and archaeologists are prone to ignore the principles of scientific reasoning *stricto sensu*, even if unknowingly, when presenting visions of the past that are meant to amplify and in a certain way justify their scholarly works in their own eyes.

Instances of that trend could easily be found in works published by the authors of the present paper, though without any pretence of qualifying as “literature”; but more illustrious examples cross every one’s mind, of books that display the literary ambitions and skills of their authors in ways that are not incompatible with the sternest form of scholarship¹¹. The concept of narrativity

¹¹ An enigmatic aphorism concludes Carlo Ginzburg’s recent presentation of the case: «A supposer que l’histoire soit scientifique, encore faudrait-il la peindre comme Elstir peignait la mer, par l’autre sens» (GINZBURG 1998, 36). Elstir, a character in *A la Recherche du Temps Perdu*, is a painter whom Proust – or his narrator’s grandmother – admires because «il nous présente les choses dans l’ordre de nos perceptions au lieu de les expliquer d’abord par leur cause» (*op. cit.*, 31; we shy away from translating into English the French translation of Ginzburg’s Italian). The difference between “presenting” and “explaining” has something to do with our distinction between the narrative and the cognitive components of scholarly constructs recalled further on.

embraces both variants and the continuum between them; the study of its place in archaeology is an integral part of the logicist programme, announced a long time ago (GARDIN 1979-1980, 178-180; 295-300) and abundantly developed in the last years (GARDIN 2001a, b). Thus, our goal is in no way to eradicate narrativity from archaeological publications, in our so-called «extremely narrow, reductionist and positivistic view of the subject of archaeology» (STUTT, SHENNAN 1990, 766), but rather to reach a deeper understanding of its specific function, distinct from the cognitive function of logicist constructs. A tentative separation of the narrative and cognitive parts of historical discourse is materialised in the collection “Référentiels” described above (§ 3, A). Unexpectedly enough, a similar distinction has recently been recommended by Paul Ricoeur himself (RICOEUR 2000), notwithstanding his dogged position of former times about their inseparability in the human sciences (summary in GARDIN 2003, 10).

5.5 *Matters of training and education*

We had once thought that the spread of the “computer literary” among archaeologists would make it easy for them to master the proposed reshaping of archaeological communication, marked as it is by the computational paradigm. This belief has not been wholly substantiated. True, no major problems seem to arise as regards the computer manipulations needed for the physical preparation of CD-ROMs or for their consultation by hypertext techniques. But matters become tricky when it comes to the elaboration of the knowledge bases which are to be stored in CD-ROMs or in the Web. The reformulation of one’s own construct (text and illustrations) in terms of an inference tree is not a straightforward task, owing to ingrained habits of natural discourse and rhetorical usage; and a proficiency in computers is of little avail for the accomplishment of that essentially intellectual operation. In fact, the two aspects of multimedia communication presented in this paper, theoretical (epistemology) and practical (new technology), are more or less independent: we should keep in mind that our vision of publication issues emerged as a by-product of epistemological and methodological concerns formulated at a time when CD-ROMs and Web sites were unknown (*supra*, § 2, B). The implication is clear: the difficulties met by many in converting natural discourse into logicist structures is a consequence of the fact that an immersion in those concerns is wholly absent from the training of archaeologists.

This situation is not likely to change rapidly, for a number of socio-historical reasons that have nothing to do with archaeology as such, as we shall recall below (5.6). Local answers will therefore have to be found outside the educational system for some time in order to overcome that particular obstacle. One of them has already been envisaged in the Arkeotek context (*supra*, § 4.6); others should be sought as the European network develops.

5.6 Socio-cultural moulds

The problem just raised takes us back to the well-known “Two cultures” divide and later attempts to bridge it by introducing the human sciences as a possible mediator between the two poles summarily designated as Science and Literature. The relevance of that debate to our present perspective has been stressed more than once (references in GARDIN 2003, 8-9; 2004). We need only recall one particular point more relevant than others to our present subject, namely the special relation that binds the academic discourse in the humanities to a broad “culture lettrée” generally impervious – putting it mildly – to the perspective adopted in this paper (LEPENIES 1987). The consequences of this bent or habit of mind on the mode of discourse recommended in the human sciences have been aptly brought out by eminent thinkers in the last years (GRIGNON 1996; BOUVERESSE 1999); they include many of the factors that are likely to hinder for some time the evolution of communication patterns sketched out in this paper.

JEAN-CLAUDE GARDIN

VALENTINE ROUX

CNRS, Maison de l'Archéologie
Université de Paris X – Nanterre

REFERENCES

- BORGHETTI M. 1995, *Studio di un caso: l'analisi di un testo di storia economica*, in J.-C. GARDIN, M. BORGHETTI, *L'architettura dei testi storiografici*, Bologna, CLUEB, 111-205.
- BOUVERESSE J. 1999, *Prodiges et vertiges de l'analogie. De l'abus des belles-lettres dans la pensée*, Paris, Raisons d'agir.
- CARTMILL M. 2002, *Paleoanthropology: science or mythological charter?*, «Journal of Anthropological Research», 58 (2), 183-201.
- GARDIN J.-C. 1979-1980, *Une archéologie théorique*, Paris, Hachette 1979, adaptation in French of *Archaeological Constructs: An Aspect of Theoretical Archaeology*, Cambridge University Press and Éditions de la Maison des Sciences de l'Homme 1980.
- GARDIN J.-C. 1998, *Prospections archéologiques en Bactriane orientale (1974-1978)*, 3, *Description des sites et notes de synthèse*, Paris, Éditions Recherche sur les Civilisations.
- GARDIN J.-C. 1999, *Calcul et narrativité dans les publications archéologiques*, «Archeologia e Calcolatori», 10, 63-78.
- GARDIN J.-C. 2001a, *Modèles et récits*, in J.-M. BERTHELOT (ed.), *Épistémologie des sciences sociales*, Paris, Presses Universitaires de France, 407-454.
- GARDIN J.-C. 2001b, *Entre modèle et récit: les flottements de la troisième voie*, in GRENIER et al. 2001, 457-486.
- GARDIN J.-C. 2002, *Les modèles logico-discursifs en archéologie*, in F. DJINDJIAN, P. MOSCATI (eds.), *XIV Congress of the International Union of Prehistoric and Protohistoric Sciences (Liège 2001), Commission IV, Data Management and Mathematical Methods in Archaeology*, «Archeologia e Calcolatori», 13, 19-30.

- GARDIN J.-C. 2003, *Archaeological discourse, conceptual modelling and digitalisation: an interim report of the logicist program*, in M. DOERR, A. SARRIS (eds.), *The Digital Heritage of Archaeology, Computer Applications and Quantitative Methods in Archaeology, Proceedings of the 30th Conference (Heraklion, Crete 2002)*, Archive of Monuments and Publications, Hellenic Ministry of Culture, 5-11.
- GARDIN J.-C. 2004, *Semiotic approaches of reasoning in archaeology: a contribution to the 'bridge' issue*, in A.V. YEVGLEVSKY (ed.), *Structural and Semiotic Investigations in Archaeology*, II, Donetsk, The Institute of Archaeology of the National Academy of Science of Ukraine (in print).
- GARDIN J.-C., GUILLAUME O., HERMAN P.Q., HESNARD A., LAGRANGE M.-S., RENAUD M., ZADORA-RIO E. 1987, *Systèmes experts et sciences humaines: le cas de l'archéologie*, Paris, Eyrolles. English translation: *Artificial Intelligence and Expert Systems: Case Studies in the Knowledge Domain of Archaeology*, Chichester, Ellis Horwood.
- GELBERT A. 2003, *Traditions céramiques et emprunts techniques dans la vallée du fleuve Sénégal*, Paris, Éditions de la Maison des Sciences de l'Homme et Éditions Épistèmes.
- GEORGE S. 2000, *Le Rapport Lugano*, Paris, Fayard.
- GINZBURG C. 1998, *A distance: neuf essais sur le point de vue en histoire*, Paris, Gallimard.
- GRENIER J.-Y., GRIGNON C., MENGER P.-M. (eds.) 2001, *Le modèle et le récit*, Paris, Éditions de la Maison des Sciences de l'Homme.
- GRIGNON C. 1996, *Le savant et le lettré, ou l'examen d'une désillusion*, «Revue européenne des sciences sociales», 34 (103), 81-98.
- GRIZE J.-B. 1974, *Logique mathématique, logique naturelle et modèles*, «Jahresbericht der Schweizerischen Geisteswissenschaftlichen Gesellschaft», 201-217.
- JOLIOT P. 2001, *La recherche passionément*, Paris, Odile Jacob.
- LEPENIES W. 1987, *Sur la guerre des sciences et des belles-lettres à partir du 18^e siècle*, «MSH Informations», 54, 8-17.
- RICOEUR P. 2000, *L'écriture de l'histoire et la représentation du passé*, «Annales H.S.S.», 55^e année, 4, 731-747.
- ROUX V. (ed.) 2000, *Cornaline de l'Inde. Des pratiques techniques de Cambay aux technosystèmes de l'Indus*, Paris, Éditions de la Maison des Sciences de l'Homme.
- STUTT A., SHENNAN S. 1990, *The nature of archaeological arguments*, «Antiquity», 64, 766-777.

ABSTRACT

Two major features have lately emerged in the communication patterns of archaeological research: (a) an increasing use of the Web as a channel of information transfer, to complement or occasionally replace printed publications; (b) an exploration of new forms of archaeological discourse related to that trend. The Arkeotek project combines the two approaches in a specific domain of archaeological research described as “the archaeology of techniques” (hence its acronym). The present paper exposes the objectives and status of the European association recently set up under that name (2002), as well as its initial works and plans for the coming years. A comprehensive introduction deals with the origins and guiding principles of the project. The paper ends with a square review of the problems that lie ahead.