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► **To cite this version:**

Aurélien Bénel. Semiotic Issues and Perspectives on Modeling Cultural Artifacts Revisiting 1970's French criticisms on 'New archaeologies'. Semantic Web for Scientific Heritage (SW4SH), Jun 2015, Portoroz, Slovenia. hal-02939560

**HAL Id: hal-02939560**

**<https://utt.hal.science/hal-02939560>**

Submitted on 22 Nov 2021

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# Semiotic Issues and Perspectives on Modeling Cultural Artifacts

## Revisiting 1970's French criticisms on 'New archaeologies'

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**Abstract.** This paper looks back at 1970's modeling initiatives in archaeology in order to draw parallels with current initiatives on applying Semantic Web techniques to cultural artifacts. At those times, epistemological criticisms were raised on the lack of consideration by these models of the semiotic value of cultural artifacts. Based on these arguments, we propose several design perspectives for computer models and tools to aim at human semiotics rather than formal semantics. Last, those models and tools are seen in action as well as how art historians make sense of them.

## 1 Introduction

“Contrary to natural sciences, human sciences formalize an already formalized object”<sup>1</sup> (J. Gagnepain, as quoted in Bruneau, 1976). As an example, “archeologists are not the first ones to describe or classify artifacts”<sup>2</sup> (Bruneau, 1976). Indeed, the people of ancient times, as designers or users, had already their own theory of their technical universe.

These statements on the very nature of human sciences in general and archaeology in particular were published in the 1970's, a time when archaeologists and art historians wanted to modernize their disciplines by using ‘models’ (inspired from other disciplines) and large ‘databanks’ to store the ‘graph of facts’ formalized with a ‘universal documentary language’. As stimulating as the modeling initiatives could have been, they were identified by critics as leading to an epistemological dead-end.

To begin with, we will look back at 1970's modeling initiatives in archaeology in order to draw parallels with current initiatives on applying Semantic Web techniques to cultural artifacts. Then, by studying epistemological criticisms raised at those times, we will see how those models failed at taking into account the semiotic value of these objects. Based on these arguments, we will propose

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<sup>1</sup> “À la différence des sciences de la nature, les sciences humaines formalisent un objet déjà formalisé”.

<sup>2</sup> “Les archéologues ne sont pas les premiers à décrire ou à classer le matériel dont ils traitent”.

several design perspectives for computer models and tools to aim at human semiotics rather than formal semantics. Last but not least, we will see those models and tools in action, and how art historians make sense of them.

## 2 Back to the future

In the field of archaeological knowledge modeling, 1972 was a decisive year with two major collective works published: *Models in archeology* (Clarke, 1972), and *Les banques de données archéologiques* (Borillo & Gardin, 1972). In both books, number of authors proposed to record the description of artifacts as well as their relationships in space or time, using statistical but also logical models on computers. Notably, set theory was adopted (Litvak King & García Moll, 1972) to formalize artifacts *taxonomies* (e.g. Every *kantharos* is a *wine vase*) and spatial *meronomies* (e.g. *Paestum* is a part of *Magna Graecia*).

For Semantic Web researchers, the more interesting works of these times are probably those that used ‘SATIN 1’ (Chouraqui, 1972), a system first designed for the French general inventory of cultural heritage. It was composed of an *analysis language* to represent artifacts descriptions, and a *query language* to retrieve or aggregate those descriptions.

As RDF today, SATIN 1 analysis language (see Fig. 1) was expressive enough to tackle with complex descriptions. For example, figure 2 shows the formal description of a small ( $25 \times 15$  mm) amygdaloidal object made of carnelian, found in Vaphio, dated from Late Helladic II and depicting a man on a chariot leading two horses (Ginouvés & Guimier-Sorbets, 1978).

Similarly to what is done nowadays in Web ontologies, every *descriptor* (‘LENGTH’, ‘HORSE’, ‘WHEELS’, ‘LEAD’) had to be defined in a *domain* (material, finding location, description, etc.), and in several domains, the lexicon could be hierarchically structured (‘LACONIA / VAPHIO’, ‘STONE / CARNELIAN’, ‘LATE HELLADIC / LHII’).

In a very contemporary way, SATIN 1 inventor pointed out that because descriptors from different domains can be mixed in the same description, the addition of new descriptors (e.g. related to decor) can be done in several ways: either adding it to every impacted domains (e.g. sculpture, furniture, architecture, etc.) or creating a new domain usable on any kind of objects (Chouraqui, 1972). Beyond the formal benefit of combinatory expressivity, the world-wide reuse of domains and descriptions was advocated by one of the promoter of these projects as a ‘necessity’ and a ‘duty’, to go from an ‘egoist and closed possession’ of information to a ‘common good’ (Ginouvés, 1972).

A nice illustration of this trend was provided in 1975 by Anne-Marie Guimier-Sorbets in her thesis on the analysis and formalization of geometric ornaments in Greco-Roman mosaics for automatic processing. In a very formal and logical way, she defined every attribute she used, and described the process one should follow to set the right value to the right segment of the artifact. Philippe Bruneau, who was on the examining board of this iconic thesis, wrote a subsequent article

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< VERBE > ::= < LETTRE > | < VERBE > < LETTRE >
< CHAINE-ELEMENTAIRE > ::= < DESCRIPTEUR > |
                             < DESCRIPTEUR > < ENTIER > |
                             < DESCRIPTEUR > < BLOC > |
                             < DESCRIPTEUR > < ENTIER > < BLOC >
< CHAINE > ::= < CHAINE-ELEMENTAIRE > |
               < CHAINE > < CHAINE-ELEMENTAIRE >
< PHRASE > ::= < VERBE > < CHAINE >
< BLOC > ::= < PHRASE > | < BLOC > < PHRASE >
< UNITE > ::= < PHRASE > | < UNITE > < PHRASE >
< RACINE > ::= < UNITE >

```

Fig. 1. Formal grammar of SATIN 1 analysis language (Chouraqui, 1972)

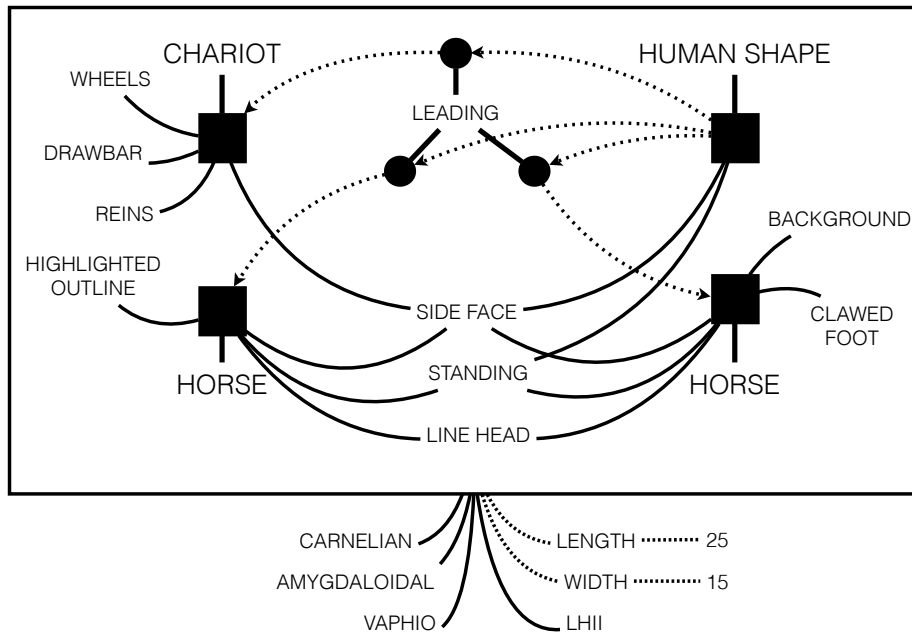


Fig. 2. Modeling a Creto-mycenaean seal and its iconography with SATIN 1 (Ginouves & Guimier-Sorbets, 1978)

(Bruneau, 1976), which spawned an unprecedented polemic in the refined world of the French School of Archaeology in Athens.

The director of publication felt the need to write a prologue (Amandry, 1977) in the following issue of the journal to give the “definition of what is and what is not [the journal]”,<sup>3</sup> stating that “The journal does not seem to be an appropriate place for doctrinal lectures or handbooks of methods”.<sup>4</sup> And even fourteen years later, the author of the thesis felt the need to reply to Philippe Bruneau’s arguments in the introduction of her own handbook (Guimier-Sorbets, 1990).

### 3 Criticisms from the past

Philippe Bruneau’s criticisms on the way cultural artifacts are modeled was focused on the notion of ‘descriptor’ (i.e. the element of an ontology – class, individual, property, etc.).

He argued, first, that descriptors such as ‘foreground’ or ‘background’ are usually chosen in order to be universal, independent of era and geography, which should be itself quite surprising in a historical science.

Secondly, he asked, what could be the validity of ‘foreground’ and ‘background’ in a case like Greek frets, where every black fret on white has a complementary white fret on black. Anne-Marie Guimier-Sorbets answered: “by convention, the fret to be analyzed is the outer one of the mosaic. The other complementary part is analyzed as background”. Philippe Bruneau noted that it was a shame to decide *by convention* that the whole description would be from the border to the centre whereas mosaics were built from the central panel to the border.

Lastly, the very term ‘descriptor’, connoting agency, would lead one to think that it is not the archaeologist but the device that describes an artifact. And to forget the archaeologist as the describer leads one to forget that the first to describe and classify the artefact was indeed the ancient user himself.

Beyond this sole example and even beyond modeling issues, Philippe Bruneau tried to formulate the very nature of archaeology as a human science. As an *arte factum* (i.e. done by human skills), the artifact is indeed a semiotic object. As the two sides of Saussure’s sign, one cannot split its material *configuration* from the *program* assigned by its designer (and by its users too).

Therefore, contrary to a common misconception, it would be meaningless to describe it factually first and to interpret it later. Moreover, as a semiotic object, its meaning depends on the other objects in the surrounding neighborhood. In a normal desktop setting, the important feature of a pen is that its writings can be erased contrary to a pencil’s. But in the absence of a pencil its main feature would be that you can write with it. And in the absence of a pipe tool, its main feature would be its form. You cannot say anything of a pencil, neither its use nor

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<sup>3</sup> “la définition de ce qu’est et de ce que n’est pas le *Bulletin de correspondance hellénique*”.

<sup>4</sup> “[Le *Bulletin*] ne paraît pas être un endroit approprié pour des exposés de doctrine ou des traités de méthode”.

its features, without knowing anything about the *state of things*, the state of its technical context. For this reason, the description of an artifact is never finished: it will be revised and revised again in a spiral approach. As rationally structured as a linguistic universe, the state of things is although always idiomatic: it can in no way be universal. Furthermore, it would not occur to anyone to describe a foreign language without ‘getting in’ the system of its users.

## 4 From issues to perspectives

Though these semiotic objections highlight rough issues in formal semantic descriptions, they also bring very promising perspectives on how knowledge modeling could serve cultural artifacts sense making. First, instead of looking for the universality of the description language, the latter should be tightly tied to the coherent *state of things* it was created for. Because an artifact is part of an indefinite number of states of things, we should strive for maintaining the identity of the artifact in overlapping states of things and corresponding analyses. Second, instead of overfocusing on inferences based on out-of-context definitions (*type*, *subClassOf*, *partOf*), one should be able to browse the different states of things and see how a feature activate or deactivate others, both at the artifact level and at the fragment level, in other words to provide interactive multi-level co-occurrences visualization. Here follows two examples of the use of our semiotic-centric tools and methods by art historians<sup>5</sup>.

The first one deals with the iconography of Dionysos and banquets on vases from the area of Paestum (Italy). To do this, the team gathered more than 600 photographs about those vases from museums all over the world. Years after years, each master or PhD student has tried to make sense about a given puzzling feature (bearded/unbearded Dionysos, face and feet in different directions, etc.) laying out their analysis on the top of the other. Our tools and methods are especially suited to the case where the meaning a feature can be discovered through the co-occurrence with another (Bénel, 2006). For example, it appeared that Dionysos was bearded when he was depicted in presence of a kantharos (a vase used in rituals). The interpretation by the PhD student (Pouyadou, 2001) was that the beard was significant of the fact that Dionysos was the god receiving offerings rather than the character of mythological stories.

The second one relates to the typology and chronology of Iron Age vases discovered in the excavations of the cemetery of Athens called ‘Kerameikos’. A recent monograph analyzed features of each vase, and then gathered them into new coherent stylistic groups. In order to review this research work, a professor used our software to model “how [the author] himself, classified it”. Then, in order to initiate Master students to research, he asked each of them to analyze the stylistic features of one type of vases. On evaluation day, he asked them to “combine features to get groups as coherent as possible” (Bénel *et al.*, 2010).

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<sup>5</sup> Pr. Jean-Marc Luce, his colleagues and students (PLH-CRATA Research team, University of Toulouse II, France).

Even if the analysis by the student was incomplete and perfectible, the vases she described as having a flat paunch (‘panse plate’) and a short lip (‘lèvre courte’) appeared to be exactly what the specialist considered to be the oldest group (see Fig. 3).

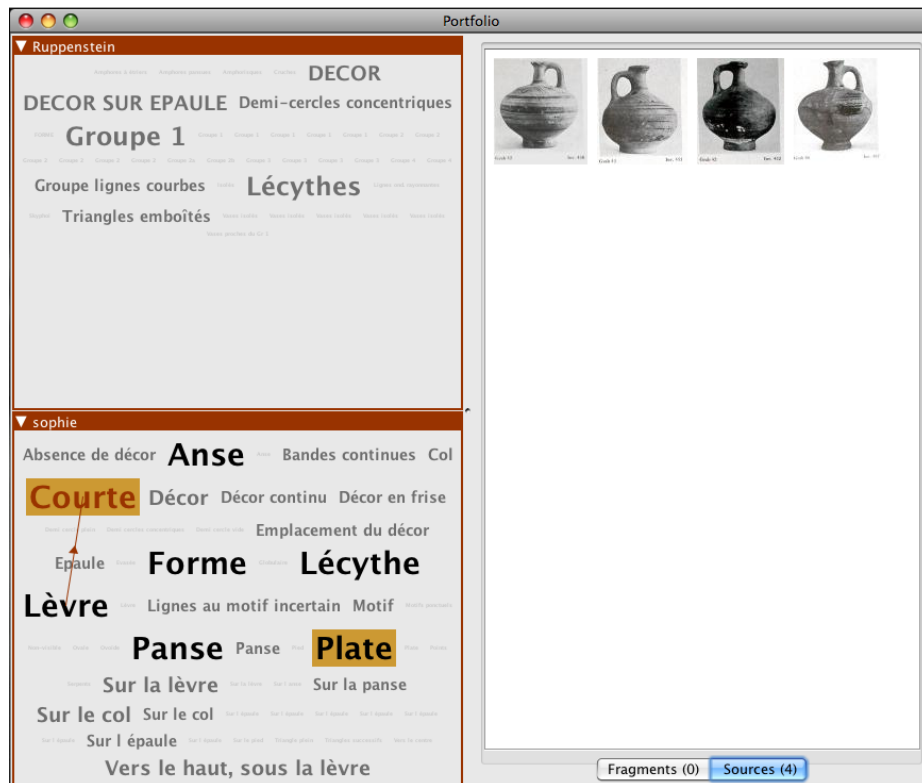


Fig. 3. “Do your stylistic features define a group?” (*Porphyry* screenshot)

## 5 Conclusion

In order not to do the same error twice, one should learn from errors in the past. In the 1970’s, criticisms on modelling cultural artifacts were about the forgotten semiotic value of cultural artifacts, and therefore the tight link we should preserve between its definitions and its *states of things*, its contexts. We then illustrated how an interactive multi-level co-occurrences visualization can be used by art historians to make sense of cultural artifacts.

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