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ARCHAEOLOGY WITHIN THE ANDALUSIAN THESAURUS OF THE HISTORICAL HERITAGE (TAPH). DESIGN, IMPLEMENTATION AND COMPUTERISATION

1. Background and origins of the TAPH

1.1 *The Andalusian Heritage Information System (SIPHA)*

The Andalusian Heritage Information System (SIPHA in its Spanish acronym) was first conceived in 1991 by the Andalusian Institute of the Historical Heritage (IAPH) as the information framework for the protection and management of the regional cultural heritage (Ladrón de Guevara 1996). Since its inception, this system was designed to integrate data pertaining to a large variety of heritage objects (whether buildings or portable artefacts of archaeological, architectural, artistic or ethnological interest, including their spatial/territorial dimension) as well as documents (bibliographic, photographic, archives etc.). Initially, the SIPHA was developed as a series of "sectorial" or disciplinary databases dealing with architectural, archaeological and ethnological objects, historical cities as well as bibliographic, documental and graphic information (for a synthesis of the Archaeological Heritage sub-system see Fernández Cacho 2002). At present, the process of integration of all those disciplinary databases within a single computerised data management environment is well under way. This system will soon be networked with the general data management system of the regional government and will be partly accessible through the Internet (Muñoz Cruz 2001).

Since the start, it became clear that one of the needs of such integrated heritage information systems would be a documentation language capable of describing the breadth and depth of the information stored in the system databases. Hence, this paper discusses some theoretical and methodological issues involved in the design and construction of that language, the Andalusian thesaurus of historical heritage (TAPH in its Spanish acronym), with a special emphasis on its archaeological dimension.

1.2 *Methodology and structure*

Traditional documentation tools such as classifications and subject heading lists, useful for the purpose of describing bibliographic information, are fairly limited when it comes to the variety of objects and documents dealt with by a heritage information system. Thesauri have become widely used as documentation tools within heritage information systems for three reasons.

First, they allow the level of specificity required for the analysis of heritage objects and documents. Second, they facilitate the post-coordination of terms, that is to say, the combination of terms for information retrieval purposes. Finally, they embody relationships of various types (hierarchical, associative) between the terms, which widen the possibilities of information indexing and retrieval.

The TAPH working group started its task late in 1995 under the coordination of Antonio García Gutiérrez, Professor of Documentation at the University of Sevilla and a specialist in documentation languages. Between 1995 and 1998, the multi-disciplinary team composed by architects, archaeologists, art historians, anthropologists, conservation experts and museum curators worked its way through hundreds of hours of meetings and discussion in order to reach their final goal.

The method of vocabulary compilation employed can be best described as a combination of the analytical/inductive and global/deductive procedures postulated for the building of thesauri (García Gutiérrez 1998). The terminological lists already in use at the IAPH Documentation Centre were used as a starting point, although the bulk of terms eventually included in the thesaurus was progressively supplied by the members of the TAPH working group.

At an early stage of its development, one obvious possibility was the construction of a discipline-based thesaurus. In this approach, the thesaurus would have been divided into sections such as *Architecture*, *Archaeology*, *Ethnology* etc. This approach would have presented at least two main advantages. First, the users would have been more familiarised with the arrangement of the vocabulary and location of specific terms within the hierarchical structure. Second, the working group would have had a relatively easier task in developing a disciplinary hierarchical structure recognisable by (and acceptable for) a majority of colleagues. However, this approach would have also involved a serious inconvenient, namely an enormous overlapping of terms that are often used in several (or all) of the disciplines involved. Some examples of this are discussed later. Therefore, the disciplinary approach was ruled out and a more thematic approach, based on a number of thematic facets, was chosen instead.

The thematic structure of the TAPH is based on 8 main facets (Table 1). They are called Activities (encompassing events, processes and techniques), Agents (individual and collective), Attributes, Styles, Structures, Materials, Objects (buildings and portable artefacts) and Periods (Geological and Human). At a semantic level, all these macro-categories or facets are carefully defined in the introduction of the thesaurus.

This thematic structure, which acts as the true backbone of the TAPH, is grounded on different theoretical approaches used in the field of scientific documentation, including the theory of categories by Ranganathan (1967)

Code	Macro-Descriptors	Second-Level Descriptors
1000000	ACONTECIMIENTOS, ACTIVIDADES, PROCESOS. TECNICAS	ACONTECIMIENTOS
		ACTIVIDADES
		PROCESOS
		TÉCNICAS
2000000	AGENTES	COLECTIVOS
		INDIVIDUALES
		ETNIAS
3000000	ATRIBUTOS	
4000000	ESTILOS	
5000000	ESTRUCTURAS	
6000000	MATERIALES	
7000000	OBJETOS	INMUEBLES
		MUEBLES
8000000	PERIODOS	GEOLÓGICOS
		HISTÓRICOS

Table 1 – First and Second Level Descriptors of the TAPH.

as well as the case grammars proposed by Fillmore (1968), Pottier (1976) and Cuhna (1990). All these theoretical approaches have in common the assumption that reality can be structured according to several viewpoints or facets; this implies a knowledge representation more to accord with the very structure of scientific reality. Ranganathan's categories in the Colon classification include Personality, Matter, Energy, Space and Time. On the other hand, Fillmore and Pottier propose a series of cases such as Causative, Instrumental, Nominative, Ergative, Accusative, Locative, Dative and others. Cunha's attempt to achieve a scheme capable of structuring a vocabulary is based on Fillmore and Pottier's case grammar and includes the Instrument, Agent, Object, Mode, Place, Product and Finality cases.

In practical terms, almost every macro-category or facet of the TPHA could be ascribed to some of Cunha's cases. Hence, the TAPH's *Agents* category is equivalent to Cunha's *Agent*, whereas the *Objects* category partly matches Cunha's *Instrument* (and Fillmore and Pottier's case grammar *Instrumental*). The *Periods* macro-category of our thesaurus is perhaps more specific to historical and prehistoric information, but even so, it could be considered partly equivalent to Cunha's case of *Place*. In the experience of the TAPH's working group, categorisation is the most flexible method with which to organise the heritage terminology (García Gutiérrez 1999, 360).

Although the initial estimates suggested a figure of 7000 to 8000 terms, the TAPH ended up incorporating more than 15.000 entries. In addition, the thesaurus includes a list of *Associated Aspects* and *Auxiliary Lists* which do not conform to the general grammar of cases used as the backbone structure (these lists include disciplines, animals, place names, names of mythical and historical characters of specific importance to the Andalusian Past, names of institutions etc.).

2. The insertion of the archaeological vocabulary

2.1 *Towards standardisation*

The role of the archaeological terminology within the TAPH must be understood from the perspective of the general trend towards standardisation of vocabulary and data structures that has swept across the archaeological discipline since the mid 1980s. On the one hand, this trend is a logical result of the growing volume and diversity of information stored by archaeological institutions, especially within the framework of the so-called *rescue archaeology*. On the other hand, it is also partly a result of the introduction of computer applications, especially databases, into archaeology.

At an international level, this trend towards standardisation has been supported by a series of legal texts, as well as a number of multilateral initiatives aimed at providing the basis for more homogeneous and consistent criteria in archaeological documentation. Among the former, the *Valetta Convention* stands out (Coe 1992). Among the latter, the *Draft International Core Data Standard for Archaeological Sites and Monuments* (CIDOC 1995) as well as various reviews of criteria and procedures for archaeological cataloguing such as the *Caere Survey* (Moscati, Tagliamonte 1998) or the *World Survey of National Archaeological Site Records* carried out by the CIDOC Archaeological Sites Working Group (CIDOC-ASWG 2000) should me mentioned. The guidelines of good practice that the *Archaeology Data Service* of York University has published over the last years (Gillings, Wise 1998; Bewley 1999; Schmidt 2001) were not conceived as international *initiatives*, but they are having a great international *impact* as *de facto* standards in archaeological documentation.

It is within this general move towards standardisation that the flourishing of archaeological thesauri must be understood. By the mid 1980s, the thesaurus was regarded as a practical tool to achieve more consistency and efficiency in the description and organisation of archaeological information. An especially interesting experience – see discussion below – stems from the pioneering work carried out in the United Kingdom where several archaeological thesauri have been published in the last two decades by *English Heritage* and the now extinct *Royal Commission on the Historical Monuments of England* (RCHME 1986; 1989; RCHME-EH 1992; 1996) or by the *Museum Documentation Association* (MDA 1997). Other examples of work carried out at a national level and relevant for Archaeology are the J. Paul Getty Trust thesaurus of art and architecture (Petersen 1990) and the French Ministry of Culture thesaurus of architecture (Chatenet, Verdier 2000). At an international level, there have been some interesting attempts at creating multilingual thesauri or glossaries for the terminologies used within Egyptology (Bergman 1994; Van der Plas 1996) and European Bronze Age studies (Coe 1995). The creation of the TAPH benefited greatly from the examination of all the experiences cited above.

2.2 *Thematic v disciplinary approaches*

As mentioned above, the integration of the archaeological terminology within the TAPH is firstly conditioned by its organisation in facets or cases. To take one example, *Objetos Inmuebles* (literally *immovable objects*, the legal Spanish term used to designate buildings) is an area of heavy terminological overlapping between Archaeology and Architecture. Since Archaeology as a discipline has traditionally had an interest in building techniques and procedures of all times, and given also that archaeological methodology has over the last decades been heavily applied to the study of standing monuments of recent historical times (for their rehabilitation and restoration), both disciplines share a wide range of interests and, of course, a large amount of vocabulary. Let us take a commonly used term as example: *wall-plaster* is placed in the hierarchy of the TAPH as a *technique of continuous lining*. As such, within the discipline-based approach this term would have appeared two or three times in the thesaurus – as a term of archaeological, architectural and possibly ethnological interest. Otherwise, it would have been necessary to enter the unlikely discussion of whether it is *more* archaeological than architectural (or vice versa) (García Sanjuán, Hurtado Pérez 2000).

Continuing with the example of the overlap between Architecture and Archaeology in the area of buildings, the economic disadvantage of the disciplinary approach when compared to the thematic approach is well illustrated by the trajectory followed in this matter by the Royal Commission on the Historical Monuments of England. Initially, two independent thesauri were compiled by the RCHME, one of archaeological terms (RCHME 1986) and another of architectural terms (RCHME 1989). In addition, a thesaurus of archaeological site types (RCHME 1989; Beagrie, Abercromby 1992) was aimed at bringing some order in the strongly decentralised, county-based English network of Archaeological Resource Management organisations, where several different data structures, terminologies and databases were simultaneously in use. At a second stage, however, this rather discipline-based approach, with separate thesauri for Archaeology and Architecture, gave way to a more thematic approach. In the second half of the 1990s, the RCHME and English Heritage published jointly a thesaurus of building types (RCHME-EH 1995) plus another one of building materials (RCHME-EH 1996), which are common for practitioners of archaeology and architecture alike.

2.3 *A troubling experience: artefact classification*

However, if the decision to adopt a thematic structure as the one described above was relatively straightforward, the organisation of the terminology across the hierarchy was quite another matter. One major problem found in this task derived from the existence of rather different taxonomic

traditions within Archaeology and Ethnology (García Sanjuán, Hurtado Pérez 2000). Thus, great difficulty was encountered in achieving a classification of *Objetos Muebles* (portable artefacts) according to the established methodologies of both disciplines (and therefore capable of satisfying the expectations of both types of users). Artefact taxonomies currently used in Spanish ethnographic museology or documentation (AA.VV. 1993) are usually based on simple categories of craftsmanship (like, for instance, stone quarrying, carpentry or shoe making), because the functional, technical and economic context of the artefacts is known first hand. Archaeological classifications are, on the other hand, more normally based on the morphology of the artefacts and/or the materials or technological process involved in their manufacture (stone objects, polished axes, metal objects). Although functional studies have advanced a great deal thanks to both experimental archaeology and the application of scientific methods (use wear analysis etc.), not always do archaeological taxonomies (especially those of prehistoric archaeology) refer to the specific crafts to which the artefacts were applied.

The solution devised to get round this problem was to favour a hierarchical structure of portable artefacts based on what were defined as *primary functions*, such as cutting tools, grinding tools, containers, ornaments etc. This allowed us to maintain the essentially functional nature of the ethnographic terminology for artefact classification whilst at the same time providing some margin for the classification of archaeological artefacts whose precise functionality is unknown. Due to the fact that functional analyses are somehow behind schedule in a good deal of Andalusian (or, for this matter, Spanish) archaeology, it is still unknown whether, say, Copper Age copper saws were used to work with wood (as in carpentry), leather (as in shoe-making) or even food, or whether they were only used as prestige items. This solution involved of course a painfully slow process of definition of primary functions, so that the possibility of ambiguity was excluded or, at least, minimised.

All these definitions were incorporated into the thesaurus in the form of Scope Notes (SC) which may be consulted in the Alpha-Systematic List (IAPH 1998, 748-754). Thus, to take some examples, a cutting tool was defined as an object with a "sharp edge used by means of pressure and a repetitive movement forwards and backwards in order to dissect another object", whilst a grinding tool is one "provided with a flat, rough surface used by means of pressure exercised by repetitive rotational movements against a still, hard flat surface in order to squash, smash or pulverise a raw matter or substance".

Of course, this solution is far from problem free. For instance, prehistoric lithic tools were arranged apart from this general scheme, because of the vagueness of the available knowledge on even their primary functions. Because of their morphology, Neolithic and Copper Age flint blades, which in Iberia reach sometimes up to 30-40 centimetres of length, were very prob-

ably used as cutting tools, or at least are interpreted as such in the literature. Proper functional analysis, however, has not yet widely confirmed this suspicion, and therefore the thesaurus made an allowance for the state of the art.

However perfectible, the classification based on primary functions allowed a fairly consistent grouping of a wide range of terms that initially seemed bound to be part of separate lists according to the disciplines (ethnological tools, archaeological tools etc.). A great deal of thought and discussion was poured into this scheme, which therefore somehow represents an inter-disciplinary consensus on how the terminology on material culture (in its widest sense) is best organised.

2.4 *Terminological precision*

An important issue in the incorporation of the archaeological terminology within the general case-based structure of the TAPH was the precise definition of terms, particularly whenever synonymies (or quasi-synonymies) and polysemies appeared. Of great help in the precise definition of archaeological terms (which often present slightly different nuances in other disciplines) was, of course, the utilisation of dictionaries of Prehistory and Archaeology. Among the dictionaries used are several Spanish ones (Ocampo 1988; Fatás, Borrás 1990; Menéndez, Jimeno, Fernández 1997; Alcina Franch 1998), foreign ones translated into Spanish (Bray, Trump 1976; Francovich, Manacorda 2002) as well as foreign ones in French and English (Brezillon 1969; Rachet 1983; Whitehouse 1985; Leroi-Gourhan 1988). Used By notes were employed to avoid synonymies or quasi-synonymies between terms of similar or slightly similar meanings. One example of this is *Vidriado Cerámico* (ceramic glazing), a term classified as a type of ceramic decoration and fairly used in the archaeological literature, which appears used by *Barnizado Vítreo* (vitreous varnish), which is its counterpart in the field of conservation (IAPH 1998, 763). In addition, Scope Notes were also used to specify the meaning given to some particularly problematic terms.

3. Current implementation and computerisation

3.1 *Terminological update*

Once the TAPH was concluded in 1998, all the SIPHA "sectorial" databases, which until then had worked with provisional lists of descriptive terms, were adapted to the new single documentation language. Confronted with the "real world", the thesaurus has experienced since then an ongoing process of update, with the number of descriptors growing from the original 13991 to 14349 in 2000. The number of non-descriptors has increased from 1284 to 1338, while the Scope Notes have grown from 1157 to 1179 and the associative relationships from 13141 to 13190. The terminology has effec-

tively increased as a result of the work carried out in the Documentation Centre, but the structure has successfully passed the test of the day-to-day practice. The organisation of the terminology on portable artefacts proposed by the TAPH has proved very flexible, and has been successfully applied to archaeological, ethnological and artistic artefacts.

3.2 *Computerisation*

Four different computer environments have been applied to the TAPH since its start. Firstly, while the thesaurus was being developed between 1995 and 1998, a specific Visual Basic application developed by the University of Málaga was used to test its functioning. Secondly, once the thesaurus was finished, each of the "sectorial" databases on which the SIPHA had been based since the early 1990s was adapted to display the list of thesaurus terms available for each field. The "sectorial" databases were developed in Access or as applications of Visual Basic plus Access.

Thirdly, the new integrated heritage information system that is being implemented at present (developed as a Visual Basic plus Oracle application) incorporates more advanced thesaurus utilities. Thus, the new system maintains the lists of field indexers, but also includes pop-up windows that allow the user to browse the full thesaurus both alphabetically and hierarchically, in case some specific term needs to be identified. Figs. 1 to 5 show an example of this, as a sequence of screens. In Fig. 1 the database is being queried for buildings and sites (*Patrimonio Inmueble*) according to functional class criteria. Within the pertinent field (*Tipologías*), the search can be run either typing in a string of characters directly or obtaining a list of terms from the blank space. Alternatively, the database can be queried by pressing the thesaurus button in order to navigate its whole structure, either alphabetically or hierarchically (Fig. 2). In Fig. 3 the searching criteria have been defined in terms of functional class (settlements or *Asentamientos*) and chronology (Prehistory or *Prehistoria*) within the province of Sevilla. As a result, a list of the sites matching the search conditions is produced. Figs. 4 and 5 show two of these sites. The first one (Fig. 4), the site of Sevilla itself, appears as a village (*poblado*); the term "settlement" is not included as a descriptor in this particular record, but the search has returned it because in the thesaurus, "village" is specific form of "settlement". The second site listed is Fuente del Arzobispo (Fig. 5), described as a settlement with no further specification of its functional nature.

The fact that the thesaurus is now completely in-built into the database has important implications for the efficiency of information retrieval. At present, in the "sectorial" databases it is only possible to retrieve information according to a given generic term if the term has previously been included as a descriptor in the records. In an archaeological example, to functionally describe an archaeological site of "settlement" type and "village" sub-type

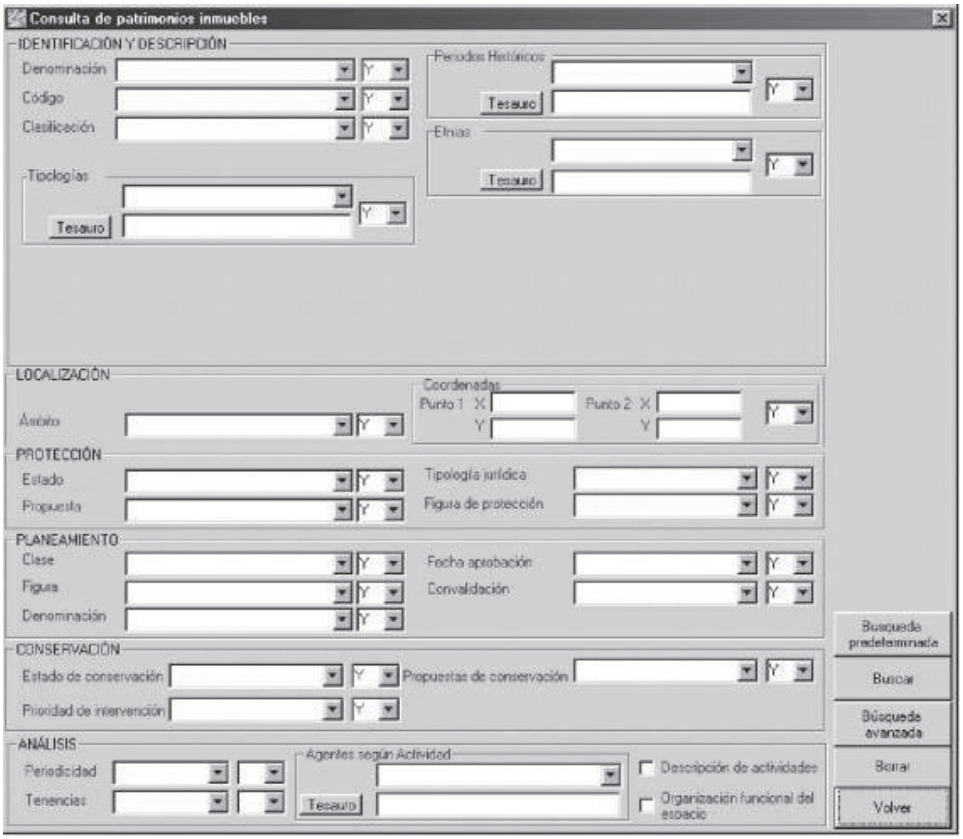

Fig. 1 – Database query for buildings and sites.

both terms, the generic and the specific, must be included in the record. As we have just seen, in the integrated system which is about to be launched, although only the specific term (in this case "village") needs to be input in the record, queries can be also successfully run on the specific "settlement" term.

Finally, since November 2003 it will be possible to consult the TAPH through the IAPH web site (http://www.juntadeandalucia.es/cultura/iaph). This step towards a wider accessibility of the Andalusian thesaurus must be framed within the general international trend that the domain of archaeological documentation is experiencing towards Internet-based facilities (Carlisle 2001; Van Leusen 2001; Kilbride 2002). The computer application used for this task, developed by the Computing Faculty of the University of Sevilla, allows the running of queries both alphabetically and hierarchically, displaying a full report for each descriptor retrieved (generic terms, specific terms, related terms and scope notes).

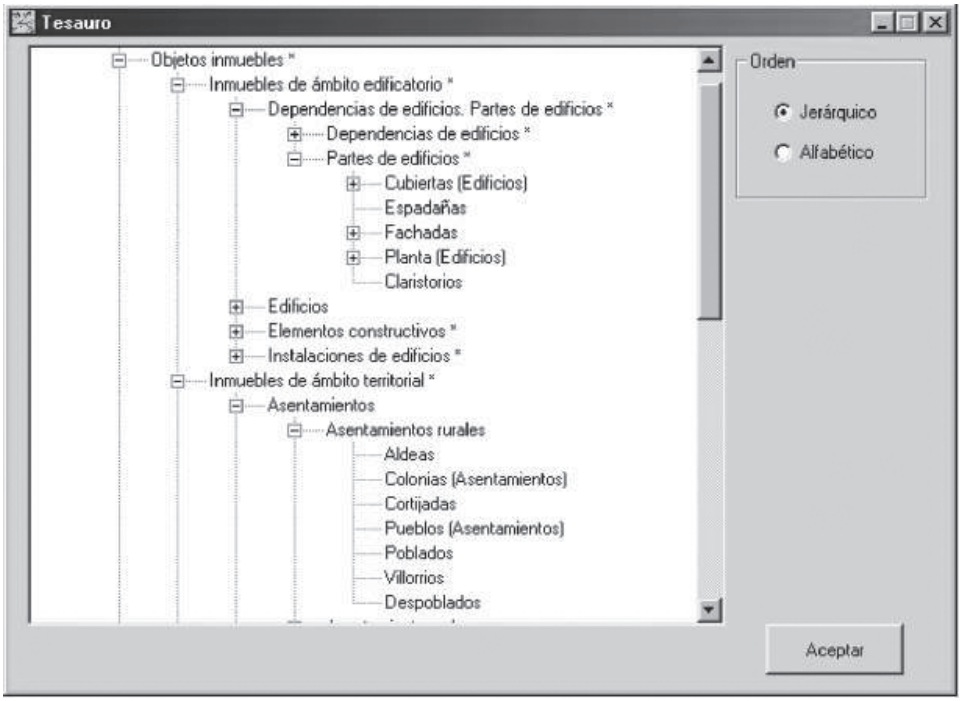

Fig. 2 – Pop up window with hierarchical structure of the TAPH.

4. Assessment

The TAPH reconciled the terminologies developed by amply different epistemological traditions. In this context, the notion of epistemological tradition equals *user expectations* and, most importantly, the *languages* used by the users/practitioners. Almost five years after its completion, the TPAH has revealed itself as a very integrative tool, both in terms of all the different disciplines (and their practitioners) involved in its use (and let us remember that its design involves precisely a unique semantic structure), and in terms of the range of objects and documents it is used to describe. The ongoing *Domus* project for the information network of Andalusian museums (Carretero Pérez 2001) is currently looking at the incorporation of the TAPH as its documentation language.

Furthermore, the multi-disciplinary, case-based, approach proposed by the TAPH conveys a significant departure from the trends prevailing so far within Spanish documentation and could open an innovative current in the professional practice (Abejón Peña 2000, 137). As García Gutiérrez (1998, 19-22) has pointed out, the TAPH has exposed some of the limitations of the international standards (ISO 2788 and UNE 50-106) currently accepted for

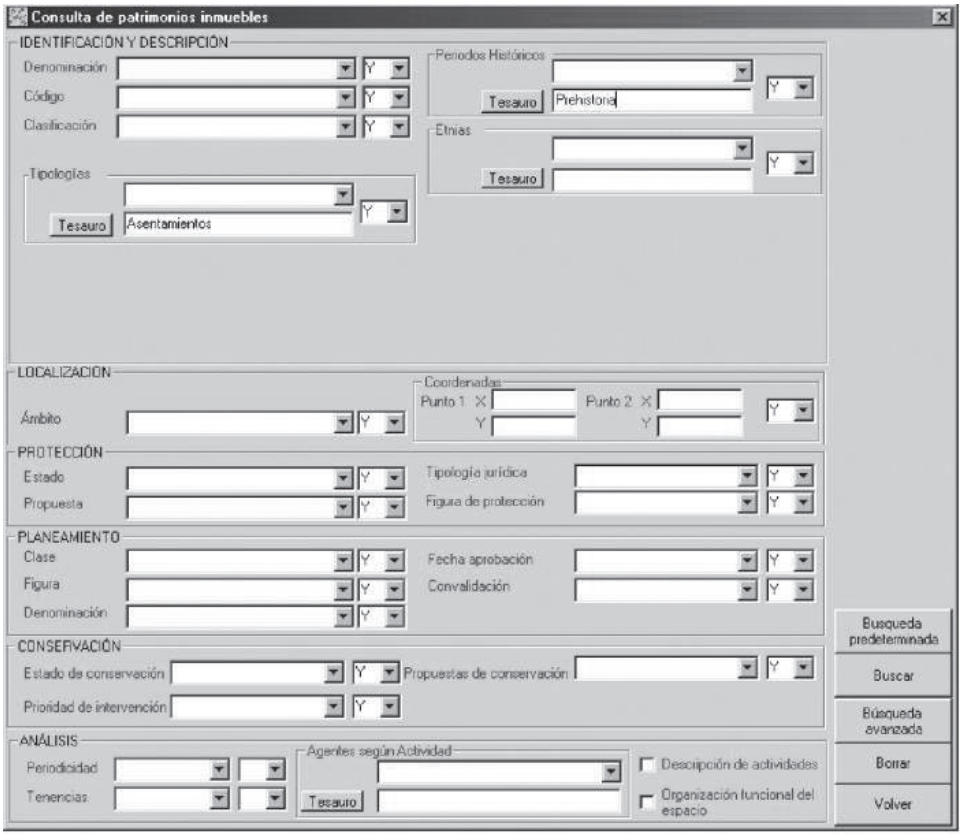

Fig. 3 – Defining search criteria following TAPH terminology.

thesaurus development (REDC 1989; 1990). Two examples of this can be mentioned. On the one hand, there is the limitation of the prevailing standards for the description of images (photographs and audiovisuals), since they overlook the expressive capacity of adjectives, gerunds or participles. The *Attributes* facet of the TAPH, which within the working group was unanimously regarded as essential for the description of heritage objects, makes heavy use of adjectives[1]. In this respect, García Gutiérrez (2000, 104) goes on further to suggest the future transformation of the TAPH into an epistemographic language by means of the inclusion of gerunds and participles capable of representing movement

[1] The *Attributes* facet makes possible multiple combinations of terms and therefore reduces quite substantially the lexical scope of the thesaurus. When querying the SIPHA databases, the user combines an object ("table") with an attribute ("square").

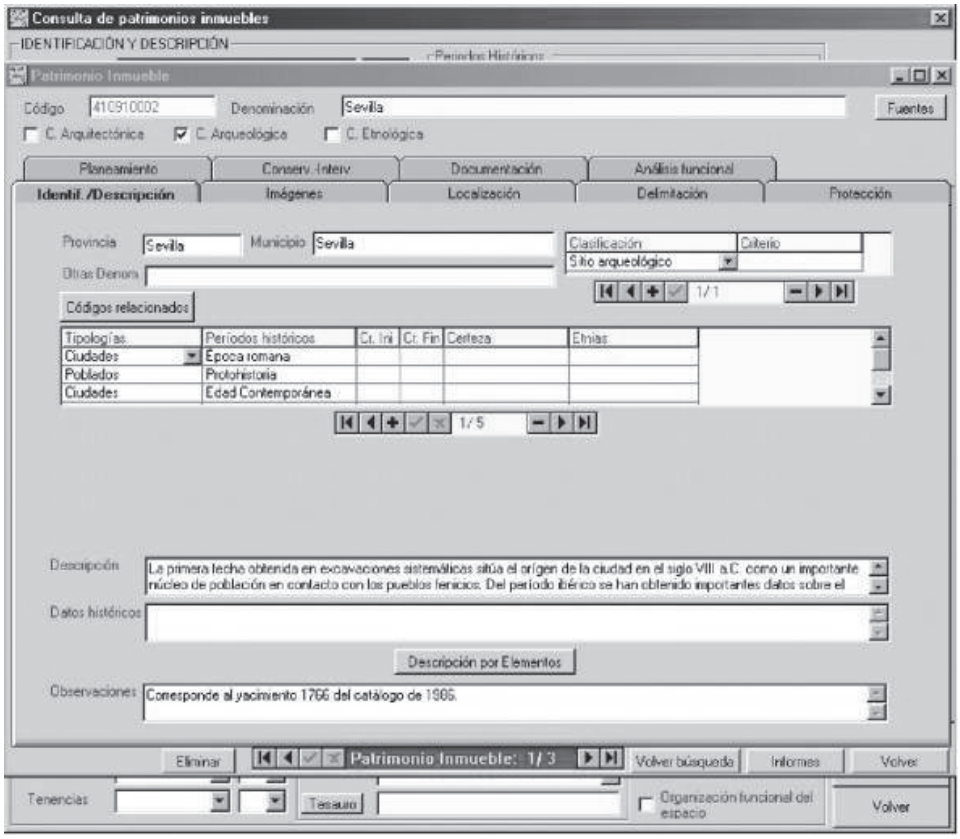

Fig. 4 – Search results for prehistoric settlements.

and states respectively. On the other hand, the accepted standard pays insufficient attention to the associative structure of the thesauri, despite the fact that horizontal relationships are fundamental in combinatory languages. To overcome this limitation, the TAPH developed its own set of rules, providing the Related Terms with three different functions:

– As tools for the construction of sintagmatic descriptors by the users (thus avoiding an inflation of terms).
– As objective operator of binary relationship between macro-categories.
– As subjective operator of binary relationship between macro-categories.

In addition, future versions of the TAPH are expected to include associative relationships between the terms of the *Auxiliary Lists* and between these and the descriptors of the thesaurus.

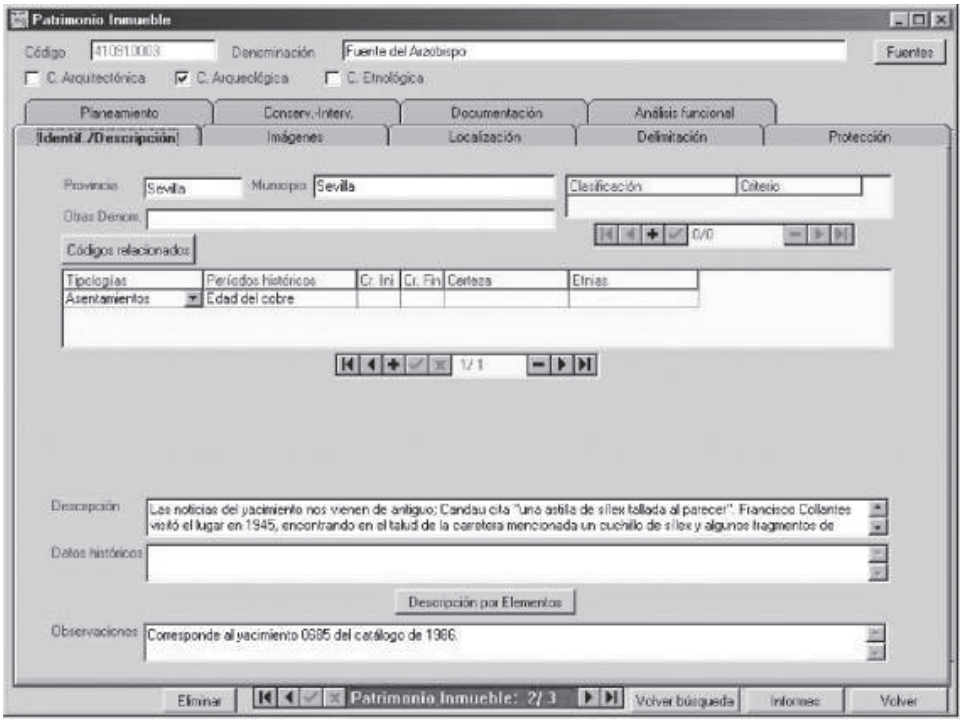

Fig. 5 – Search results for prehistoric settlements.

In conclusion, four years after its completion, the TAPH has proven a useful tool for the documentation of the Andalusian heritage at large, and more specifically of the archaeological heritage. Given the approach and methodology applied, the archaeological lexicon has become embedded within a larger language capable of describing the regional heritage at large. This has involved some serious conceptual problems, some of which have been described in the preceding pages. The TAPH is simply a product of its time: a time where documentation is carried out by means of computerised, networked databases operated by several individuals with very different professional backgrounds (and who therefore use distinct professional jargons). This demands robust means of language standardisation.

In the future, archaeological thesauri may evolve into wider epistemographic languages that facilitate the newly born relationship between the user and the information system within the Information Society. Epistemographic languages are more efficient in the search and retrieval of information because they are closer than other documentation languages to the natural language that the user would like to use to perform his/her query. In these new

documentation languages, expert systems and hypertexts that allow horizontal navigation have a very important role to play (García Gutiérrez 1998, 96-105). As we have shown before, although a thesaurus in the conventional sense, the TAPH includes some elements of epistemographic languages that enhance its performance as a flexible logical-semantic documentation tool.

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ABSTRACT

This article discusses the criteria and methodology applied for the insertion and later development of the archaeological terminology into the Andalusian Thesaurus of the Historical Heritage (TAPH), published in 1998. Firstly, the background and precedents that gave way to the creation of such documentation language are dealt with. Secondly, we comment upon the problems encountered in the integration of the archaeological vocabulary within a thesaurus that comprises several other heritage-related disciplines such as Architecture, Ethnology or Art History. Thirdly, the significance of the TAPH five years after its publication is evaluated, with a special emphasis in the process of its implementation and computerisation within the Information System of the Andalusian Historical Heritage.