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Advocating for a change of approach in the development of metadata standards: historical celestial cartography as a specialization example

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ABSTRACT

We live in a highly volatile technological environment, in which the generation of new data and information access tools has increased the level of specialization of the users' information needs. In this changeable scenario, standards and the role of librarians must also evolve along with the services provided to users. The lack of specialization in standards is leading librarians to improvise local solutions when cataloguing specialized resources, thus failing to benefit global interoperability among libraries, and with other institutions and initiatives. As different cataloguing standards, as well as many conceptual models, point out the necessity to deal with the specific users' needs, the main goal of this paper is to advocate for meeting those needs through the development of metadata standards. In particular, our methodology consists in showing and explaining the needs of a particular type of users (astronomers and astrophysicists) and proposing the inclusion in the standards of elements important for the description of historical astronomical resources. Through an example, we show not only the feasibility of application of these elements, but also how the enhancement of the level of specialization of the standards, and therefore of the records made under their rules, can definitely contribute to a global solution for a much improved scientific information retrieval.

KEYWORDS

Metadata; Star Charts; Celestial Cartography; Cataloguing Standards; User Astronomical Needs.

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Introduction

We are currently witnessing a trend toward simplification or generalization of metadata standards. The creation of conceptual models in all scientific and cultural spheres, as the necessary architecture to interrelate standards in the computer environment, may have induced someone to think that standards and the cataloguing process should also be simplified. However, this idea does not match the increase in specific needs currently required by specialized users. The economic crisis that in 1990 led to the elaboration of the Functional Requirements of Bibliographic Records (FRBR) Report has not disappeared; on the contrary, it has intensified. Nevertheless, today the development of science and technologies require more specific ontologies and higher quality data.

Standards should be created always keeping users in mind, and this point of view requires a change of approach. But what kind of users are we referring to? Mainly specialists and researchers who would potentially want to use the data preserved in libraries and archives, whose retrieval depends essentially on the quality of our standards and search interfaces. However, specialized users do not usually find what they need because the metadata required for their searches are missing (Tosaka and Weng. 2011; Alonso Lifante 2014).

Sciences, such as astronomy, require a high degree of current and past information to be compared, in order to detect phenomena that otherwise would be impossible to measure. However, to do this, it is first necessary to find the resources that contain the desired information. At this stage, the cataloguing work done by librarians is crucial to making the resources retrievable, especially when these are held only in specialized libraries. This is one of the contributions that libraries can give to scientific development. However, this is not the position that is being taken in library environments, which require more general standards.

In this regard, due to the particular information-seeking behavior of specialists such as astronomers, astrophysicists, etc., having very generic metadata does not help them locate resources and this could also hamper the process of information comparison, integration and relation in an automated environment. In this respect, Linked Data, as a technology, allows for this relationship and comparison process, although it requires metadata to be declared in the current bibliographic ontologies. Therefore, the question we should answer is: should more elements and vocabularies be declared in RDF to be able to serve these specific needs?

The objective of having new and old data to compare is essential in astronomy and other sciences. However, this data must be computerized and made available in corresponding databases. In this regard, while the availability of electronic data is enhanced by database accessibility via the Internet, printed information is nearly invisible in many cases, mainly due to two reasons: resources are unregistered as they have not yet been catalogued; or, they are indeed registered but their cataloguing level does not allow potential users to find them. The first reason is really dramatic, because invisibility is total and, in the absence of a bibliographic record, no further action can be accomplished. The second reason, instead, has focused the attention of several authors (Tosaka and Weng 2011; Griffis and Ford 2009). On one hand, current cataloguing standards used in libraries are too generic to describe specialized resources such as the astronomical ones. On the other hand, even though a certain level of specialization holds, the existing fields are not being widely used by cataloguers to describe these

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resources (Alonso Lifante and Molero 2015). This assertion is also supported by the Council of Library Information Resources (CLIR), since they state that "Libraries, archives, and cultural institutions hold millions of items that have never been adequately described. These items are all but unknown to, and unused by, the scholars those organizations aim to serve".[1] As a consequence, specialized users encounter plenty of difficulties in accessing the records, since their searches usually address particular data rather than more common elements such as titles or authors.

In brief, the authors of the present paper review the current library standards panorama, focusing on the specific points that call for the presence of more specific descriptive information, as the development of all standards is based on the users' task. The article includes an analysis of how some observatory libraries provide their users with different levels of information when cataloguing historical cartographic resources, and a summary of the content elements proposed for inclusion in standards, together with an example showing how many of these elements can be added in a more specific description. With the above, it demonstrates the necessity of a change in mentality on the part of the people involved in the creation or revision of the content standards.

Conception evolution in the development of metadata standards

The economic crisis of the 90's in which we are immersed

In the 1990's, the economic crisis that had affected libraries led to the creation of a working group in charge of examining and determining the minimum essential requirements for cataloguing, taking into account the needs of the user. It was hoped that the cataloguing descriptive information, as well as its cost, would be reduced. This approach and objectives must be viewed at the time of a specific technological environment, when we had not yet reached the current degree of development of the Semantic Web, Linked Data, Open Data, etc. and all that these technologies have meant in terms of widening horizons for the reuse of data and the added value deriving from its interconnection.

The report produced as a result of that working group, Functional Requirements for Bibliographic Records (FRBR, 1998), was later expanded in two models: Functional Requirements for Authority Data (FRAD, 2009) and Functional Requirements for Subject Authority Data (FRSAD, 2010). All of them, together, make up what is known as the FRBR family models: each one was created on a different date, specifying the functional requirements in their field of application and, in turn, each one was affected by the technological advances of the moment.

The models do not establish if the information elements are mandatory, but focus on the structural analysis of conceptual entities, and how these are characterized to allow their identification and interrelate among them. Philosophical models only establish, in a logical and organized way, the elements or attributes that correspond to or characterize these entities, defining them and specifying which function of the user task they are important for.

It could be said that, contrary to the reduction of elements pursued and expected as a result of this report, these were not only unreduced, but their importance was stressed, together with their

[1] https://www.clir.org/pubs/reports/spiro/report.html

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usefulness in different functions or tasks that the user realizes in his interaction with information. The elements traditionally given in the bibliographic and authority records, were even expanded in the successive FRAD (2009) and FRSAD (2010) models, a decade after the publication of the FRBR model. The latter models give importance to data needed for other functions, more in line with current technological developments, promoting or supporting international uniform identification, linkage and navigation.

The three models were necessary in a complete bibliographic system, but this involved making local decisions on certain rather complex issues that were not solved with those models. For this reason, it was recently decided to merge them into a single document called IFLA Library Reference Model (2017). By providing a common level of understanding of the three models, LRM presents a higher level of abstraction, due to the inclusion of the very abstract FRSAD model. LRM is a logical model catering for structural organization, and for this reason it is more distant from the practice than the previous models. At the same time, it moves forward, by adopting the form necessary for use with Linked Open Data applications.

However, at the practical level it is still required that standards for guiding practice be developed, as recognized by LRM itself:

> The model developed in the study is comprehensive in scope but not exhaustive in terms of the entities, attributes, and relationships that it defines. The model operates at the conceptual level; it does not carry the analysis to the level that would be required for a fully developed data model ... In consequence, data elements that are viewed as specialized or are specific to certain types of resources, are generally not represented in the model... The model is comprehensive at the conceptual level, but only indicative in terms of the attributes and relationships that are defined (IFLA FRBR Review Group. Consolidation Editorial Group 2017, 7).

It is thus acknowledged the need for content standards and rules that include those "extensions", as they are named in the model, i.e. the necessary development for its practical application.

Therefore, the specificity of certain special resources must be settled at the next stage of development of standards governing the practice, so that the bibliographic system can meet and respond to the end users' tasks with specific resources. These tasks are also defined in the LRM model as: Find, Identify, Select, Obtain and Explore.

All of them are important when we are dealing with special or specialized resources, in particular the first for our purposes: "Find - To bring together information about one or more resources of interest by searching on any relevant criteria". (IFLA FRBR Review Group. Consolidation Editorial Group 2017, 13). Indeed, in section 3.3, the following comment relates to the *Find* task:

> To facilitate this task, the information system seeks to **enable effective searching** by offering appropriate search elements or functionality (IFLA FRBR Review Group. Consolidation Editorial Group 2017, 14).

Therefore, it can be said that the user tasks justify the existence of specific elements that are relevant for a particular scientific domain. Their presence will enable users to carry out the search, understand

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the nature of the resource and its selection or rejection in order to access its content. To clear any doubt, it is necessary to specify the meaning that the word 'resource' has in the context of the model:

> In the description of the tasks, the term 'resource' is used very broadly. It includes instances of any of the entities defined in the model, as well as actual library resources. This recognizes that library resources are what is most relevant from the end-user point of view (IFLA FRBR Review Group. Consolidation Editorial Group 2017, 13).

It can be seen, moreover, that not only the aforementioned models support specialization, but also the IFLA *Statement of International Cataloguing Principles* does. In fact, in its 2016 edition, article 2.5 states:

> Sufficiency and necessity. Those data elements that are required to: facilitate access for all ypes of users, including those with specific needs; fulfil the objectives and functions of the catalogue; and describe or identify entities, should be included (ICP 2016, 5).

This is a key issue, as it is not possible to search, find and access the content of specific resources if the appropriate searchable elements do not exist in the cataloguing descriptions. This point is especially crucial today since, with the available technological means, many more functionalities can be reached. As a matter of fact, after gaining access to a given resource, it is possible to compare, link, and even obtain derivative information results, which may ease the evolution and development of science. But machines lack the human capacity to suppose that such resources could have interesting content to access and develop such different possible actions.

In the C*omments* column in IFLA LRM Table 3.2 *Definitions of User Tasks*, there are more arguments that also support our thesis:

On the *Selection* task, it is added that "… the information system needs to **allow/support relevance judgements** by providing sufficient appropriate information about the resources found to allow the user to make this determination and act on it." This added comment and explanation is related to the aforementioned principle, which states that the information required by the user should be provided.

The remark added to the *Obtain* task is very illustrative, as it makes reference to interrelated or linked online information: "To fulfill this task, the information system needs to either provide direct links to online information, or location information for physical resources...". This point is also supported by the comment on the next task

Explore: "… the information system seeks to **support discovery** by making relationships explicit, by providing contextual information and navigation functionality."

As it has been said, resources are what is most relevant from the end-user's point of view. Therefore, it is also necessary to understand what the model considers as "end-users", since the relevance is established from their point of view and consequently registered in the standards that rule this system. We find this to be a very broad concept: "The data may be used by readers, students, researchers and other types of end-users, by library staff, by other actors in the information chain." (IFLA FRBR Review Group. Consolidation Editorial Group 2017, 13).

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If the standard does not provide the specific elements required and requested, the principle of sufficiency and necessity of the elements for all types of users, "including those with special needs" wouldn't be accomplished and we could be facing an extension of the category of impeded users.

Taking into account the above arguments, it is clear from the conceptual model and from the ICP that the development and extension of the attributes or elements defined in a content standard should be well grounded, allowing the bibliographic systems to offer those elements of information considered necessary and essential for specialized end-users, and thus facilitate their interaction with the information. This should be the responsibility of a content standard that governs practice and establishes these elements.

Nevertheless the IFLA Cataloging Section Standing Committee Minutes from Lyon meeting in 2014, reveals the discussion. After some debates on the six possible scenarios for the revision of the ISBD standard, finally these have been reduced to option A2 and option C. Option A2 acknowledges the controversy and calls for a more in-depth revision, maintaining its level of specificity but adapting it to the technology and the model. Scenario C clearly aims "to make the consolidated edition shorter, simpler and more principal ..." (IFLA *Minutes* 2014).

Thus, not only a change of approach is necessary in favor of more specific standards, but also the recognition of the needs of some specific specialized users. Libraries will not be able to address the current challenges with the same criteria and restrictive approach of the 90's, since from then on, there have been some technological developments impossible to ignore. It can be said that what the standards provided at that time is no longer sufficient today to offer the basic services that the library has always provided. It will not be possible to satisfy the needs of the users that today are increasingly demanding for specific and detailed information, nor reaching the objectives that the libraries have always had of supporting the scientific, social and cultural development of society.

Whilst it is true that the crisis is not over, its solution does not lie in reduction, exclusion or elimination of content guidelines. With it, there will be a transfer of responsibility to local library management or even to users, which will have to "expand" the standard according to the institution objectives, thus limiting the potential links to be made and therefore the Explore task of the user. It must be taken into account that this extension work requires human resources, specialized in metadata and, if it is desired that the full potential of information is reached within the current technological environment, then experts in its declaration in RDF and Linked Data technology are needed. As not all libraries have these expert human resources, this process would result in a more expensive solution for libraries and impossible for the end-user. Therefore it is easy to deduce that the necessary extensions will not be carried out in certain areas.

The technological advances that make possible a change of approach

The current technological advances allow for actions that were impossible to accomplish in the past. Search engine robots of new generation catalog, discovery tools can act on several databases in record time by a given criterion (element or property), provided that in those databases that element being searched exists or is defined. Robots that, once find that information, can collect the information found and work with it, as a result will produce more information.

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Thanks to Linked Data (LD) technology, this is possible and can lead to the acquisition of more useful information. Open data from different sources can be connected, allowing for semantic queries, retrieving information contained in data that will be understandable not only by humans, but also by machines, allowing both to interact with it, searching similarities and inferring answers, a process from which conclusions can be drawn. The linking of information resources and their comparison provides results that in the past were expensive to obtain. Today this task is accomplished in a faster way, enabling further development in all scientific fields.

In order to make library standards evolve, and adapted to today's technology, it is necessary to declare each element in a RDF registry. Currently, a library standard provides rules or guidelines not only for cataloguing, but also for recording elements in a RDF registry, thus constituting the ontology needed by the machine to understand the data.

It is thanks to publishing these elements with LD technology and collecting the information registered under those metadata that all the previous actions can be carried out. In consequence, it is fundamental that the specific elements necessary for specialized users are also included in this ontology and this requires their definition as elements in the standard.

At the International Open Data Conference 2016, it was stated that:

> Datasets should be published in a predictable and consistent manner to reduce the effort required to use the data they contain. Furthermore, published datasets should be comparable and interoperable with other datasets to reduce the effort required to combine data from different sources. To achieve these goals, publishers must adopt common open standards and publication practices for metadata... (International Open Data Conference 2016, 37).

Libraries could play an important role by promoting this openness, teaching the path to follow with their know-how and practice with metadata, creating and publishing metadata in an organized and structured way, thus influencing a movement that is already unstoppable. Library standards on metadata are the tools necessary to reach the extremely important aim of providing specific and high-quality open data.

Being ISBD the most global and worldwide-known international description content standard for "resources", the research conducted to update it should try to make it evolve by including more information, not the contrary. It is supposed that following this example, other content standards such as RDA and REICAT would also include at least the metadata requested by specialized expertise users to manage data in their field. It is also necessary that mappings and alignments of models be done to show how these can be applied and also as a way to interrelate with other environment metadata standards, thus facilitating the interrelationships between information domains.

Technology is always in the front and forces the development of scientific fields. If librarians want to continue providing service and contributing to scientific development, they will have to adapt to these changes or will run the risk of losing their usefulness and role in society.

The best way to understand the needs and gaps in the standard is to present an example: the charts of the international project "Carte du Ciel", one of the first and most important cooperative international

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astrographic projects. The celestial charts and catalogues resulting from this enterprise are preserved in libraries and their information is still fundamental even today.

An example of specialization in the field of astronomy: historical celestial cartography

Overview

Since ancient times, human beings have looked at the night sky trying to understand the universe and our position and role within it. To achieve this end, our ancestors started to record celestial phenomena (motion of stars, planets, eclipses, comets, etc.) giving rise to the first handwritten documents measuring and analyzing those phenomena (Perryman 2012). Over time, these rudimentary documents have given way to more complex resources such as celestial charts and star catalogues (see Kanas 2009 for further details). More recently, with the advent of computers, the Internet, modern space and base-ground telescopes, information has begun to be gathered and stored in large electronic databases, the printed format being set aside for educational and outreach purposes (Perryman 2009).[2]

Storing and analyzing astronomical data generated throughout the last few centuries, has led to relevant discoveries, such as the recent finding of the accelerated expansion of the universe. Thus, every newly planned space mission and project will generate large amounts of new data that will be stored and analyzed, and hopefully produce new and amazing results, opening new questions whose answers will depend on new projects. It is also important to highlight that other important discoveries were also made by means of non-computerized data, i.e. astronomical information contained in old textbooks and available only in a printed form (see Perryman 2009, Perryman 2012, Vaquero et al. 2016).

On the description of historical astronomical resources

Star charts and catalogues are two examples of a large variety of existing historical astronomy resources containing information about celestial objects. Star charts are diagrammatic representations of the positions of stars up to a specific brightness from the whole or a bounded area of the celestial sphere. Star catalogues are books with tables of listed stars, usually arranged according to their positions (i.e. celestial coordinates); magnitude (brightness), etc., and other physical parameters such as spectral types, proper motions, etc. - all being of special relevance for astronomers and astrophysicists - are often indicated. With the advent of technology, parameters given in star catalogues are more and more numerous.

The degree of specificity of the information contained in these resources somehow dictates the type of search performed by potential users. For astrophysicists and astronomers it is a great relief to be able to find the data they need, without having to worry about the source of such data. The advantage of having large storage databases bringing together information coming from a variety of reliable sources, searchable through new information retrieval systems, in the past few decades has led to the

[2] See also http://sci.esa.int/gaia/, https://www.nasa.gov/mission_pages/hubble/servicing/index.html.

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development of systems such as SIMBAD[3] and NED,[4] in which searching can be carried out in different ways. For instance, celestial objects can be identified through their coordinates, magnitudes of brightness and other parameters.

Obviously, this kind of search is not possible through libraries' OPACs, as their searching interfaces do not allow for specialized queries by parameters such as coordinates, magnitudes of brightness, proper motions, etc. One of the reasons why these interfaces have not yet evolved is the lack of specialization of the prevailing cataloguing and encoding standards (ISBD, RDA, REICAT, MARC 21, etc.). Indeed, despite the efforts made by bibliographic agencies trying to enhance these standards, they are still too general and do not provide the elements needed to create sufficiently specialized content descriptions.

The solution, which cannot lie exclusively in massive digitization projects with Optical Character Recognition, is twofold: 1) incorporate new descriptive metadata to create bibliographic records which are more complete, taking into account the content of the resources, and 2) make further and better use of those existing fields and elements that are not being widely used by cataloguers, due to their lack of specialized knowledge.

The Carte du Ciel enterprise: an example of cataloguing historical celestial cartography

Promoted by the Paris Observatory around 1880, and ended in the 60's of the XX century, this international project aimed at the realization of a photographic survey of the entire sky, to be published as an astrographic catalogue and a chart atlas. Eighteen astronomical observatories sited all over the world took part in the project, each of them with an assigned zone of the sky, which had to be photographed in order to obtain data for a star catalogue up to the 11th magnitude and charts up to the 14th. The photographic procedure adopted entailed taking 2, 3 or 4 glass plates of 30 minutes exposure with the Carte du Ciel astrographs. Several glass plates, overlapping in the central zone, were produced as a security protocol, to avoid losing data, and then converted in a single copper cliché which could act as a mould for printing charts. The photographic glass plates, being positive, could hold more information than their derived products.

However, the Carte du Ciel project was not entirely fulfilled, in that not all the charts were published for economic reasons, and the new perspectives of astronomy in the 60's had rendered obsolete the star charting work.

In the past few decades attention has been brought again to the original photographic plates (Jones 2000), as in 1997 new reductions of the stars using the data deduced from the plates, has allowed astronomers involved in the preparation of the Tycho catalogue to add information covering a time span of 80 years, thus contributing to improve accuracy of the stars' proper motions by an order of magnitude, and in the long run be helped to understand the structure and evolution of our galaxy.

[3] SIMBAD astronomical database http://simbad.u-strasbg.fr/simbad/.
[4] NASA/IPAC extragalactic database (NED) https://ned.ipac.caltech.edu/.

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Quite recently, attention has also been given to the paper charts (Laskov and Tsvetkov, 2013), also known as astrographic maps, as some new research projects aim to find relevant information even out of this material. A typical Carte du Ciel star chart is the one as realized by the San Fernando Observatory that can be seen in figure 2.

Although not directly involved in the enterprise, the Palermo Observatory holds the majority of the charts printed, and almost all the volumes of the astrophotographic catalogue. The library has recently re-catalogued the charts. Prior to this, a brief survey of catalogue records retrieved by searching "Carte photographique du ciel" on KVK (Karlsruhe Virtual Catalog) has shown a variety of solutions adopted by librarians worldwide.

At the Paris Observatory, where the complete collection of charts is held, a single collective record for all the charts was made, bearing "Carte photographique du Ciel" as title and Observatoire de Paris as main responsibility. A content note enlists the various sets making the atlas, each designated by its declination (e.g. Zone -3°, Zone +18°, etc.), followed by the name of the observatory which took the photographs, and the number of charts constituting each set (usually 180).

In the Canadian National Catalogue record, data are limited to title, responsibilities and printing information. In other cases, although the basic information is present, either the responsibility (University of Illinois) or the declination zone and the progressive number printed on the sheets (COPAC) are missing. In general, right ascension, declination and equinox are not indicated.

The solution adopted at the Palermo Observatory library has been that of a two-level description: first level with common data, i.e. the title proper of the entire sky atlas, linked with an entry for the parallel title ("Carta fotografica del Cielo") and general responsibility assigned to all the observatories which produced printed charts; at the second level the various sets of charts, each made of maps having equal declination, but slightly different right ascension.

The INAF record for Zone 18°, made of 180 charts, as displayed by the OPAC, is illustrated in figure 1.

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Figure 1. A snapshot of the INAF OPAC showing the description of Zone +18° of the Carte photographique du Ciel, made by the Paris Observatory.[5]

As it can be seen, map scale, sky coordinates and equinox are located in area 3 of the ISBD standard. The choice of not cataloguing each single chart implies losing some information which could have been given in the notes area: the inclusion of a pdf file per zone with further data (the exact center of the right ascension for each chart held, the date when the plates were taken, and the names of the astronomers who took them) seemed like a reasonable compromise, though it excludes the possibility that this text can be automatically searched through.

At San Fernando Observatory the Carte du Ciel material has also been recently catalogued. The printed charts, copper clichés and glass plates are kept in different sections (archives, library and museum) at the San Fernando Observatory, and were described following different criteria and granular level. When deciding to digitize all collections it was chosen that information would not be lost, but even enhanced by means of creating a horizontal relationship among the glass plates, their corresponding copper clichés and the final printed charts. The cataloguing project was necessarily conceived with descriptions at a very specific level that allows the creation of relationships with the corresponding resources, and by means of authority records that collect all sets of records and link with other projects contributors.

However, most of the specialized information is accommodated in the note field, at the risk of not being retrieved, as the cataloguing standard fails to provide a special area for content information. It is

[5] http://www.inaf.it.

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definitely up to documentalists, librarians and/or cataloguers working at astronomical libraries, to address the task of identifying the parameters that are of interest for their users, and also of enhancing bibliographic records accordingly.

Parameters to be declared as new elements and an application example

Some of the problems encountered in cataloguing the above material can be solved by:

1. adding some parameters as new elements to be declared;
2. introducing important nuances about existing elements such as Epoch, Equinox, etc.; and
3. enhancing the definition and use of some classic cartographic elements such as the celestial coordinates (Right Ascension and Declination).

Going deeply in point 2 is out of the scope of this paper, as it is available in Alonso Lifante and Molero 2015. Thus, we only focus on those parameters that we propose to be defined and declared as new elements (see Table I).

Parameters	Basic considerations
Astronomical instruments	Instruments used to make observations and/or create the star chart.
Celestial hemisphere	Positive declinations correspond to Northern Hemisphere and viceversa (negative declinations correspond to Southern Celestial Hemisphere).
Constellation images	Recording whether the star chart has constellation images. For instance, mythological images or stars connected by lines, etc.
Constellation names	Name of constellations shown in the star charts or atlas and which enables the first recording of the location of celestial objects contained in the documents.
Elements given as columns of the main table of a star catalogue	They provide with data such as: position, distance, brightness, etc., of the stars collected in a star catalogue.
Magnitude	Magnitude is a value that indicates the brightness of a star. The range of star brightness, when known, should be recorded.
Objects of interest	Comets, supernovae…

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Parameters	Basic considerations
Observation period	The date in which the astronomical observation was made.
Observation place	The place where observations were made, that it is usually an astronomical observatory.
Perspective	This parameter can only have two values: – Internal or geocentric perspective: constellations are represented in the chart as seen from the surface of the Earth. – External perspective: constellations are represented as seen by an observer located beyond the heaven vault.
Related documents	For example, citations to scientific works published separately from the star atlas, which could provide useful information for astronomers.
Time of exposure	Time set for a camera to be capturing light (longer exposure times are associated with the capture of dimmer celestial objects).
Wavelength or frequency	Wavelength of the electromagnetic spectrum selected to take the photos of the star charts.

Table I. Proposal of astronomical parameters to be declared as new elements in the cataloguing standards ISBD, RDA and REICAT.

The reader can see the proposed parameters at the Ministry of Defence Digital Library, as applied to records of celestial charts from the Carte du Ciel project (collected at the San Fernando Observatory) which have been recently re-catalogued. Many of these parameters which we are going to focus on, are not separately defined neither in ISBD, nor in RDA or REICAT. The examples show how the information has to be accommodated in general notes fields of the encoding format, due to the nonexistence of the corresponding elements.

We refer again to the celestial chart from the Carte du Ciel project (see figure 2), in particular to the "Observation place", "Range of magnitudes", "Time of exposure" and "Observation period" parameters, which have been framed inside blue boxes. Please note that not all the parameters given in Table I are included in this example, for two reasons: a) not every star chart catalogued explicitly contains all of them; and b) not all the parameters are available/recognizable in a straightforward way by cataloguers, and this is why their registration is not mandatory. However, their identification and inclusion in the record is essential for a better information retrieval.

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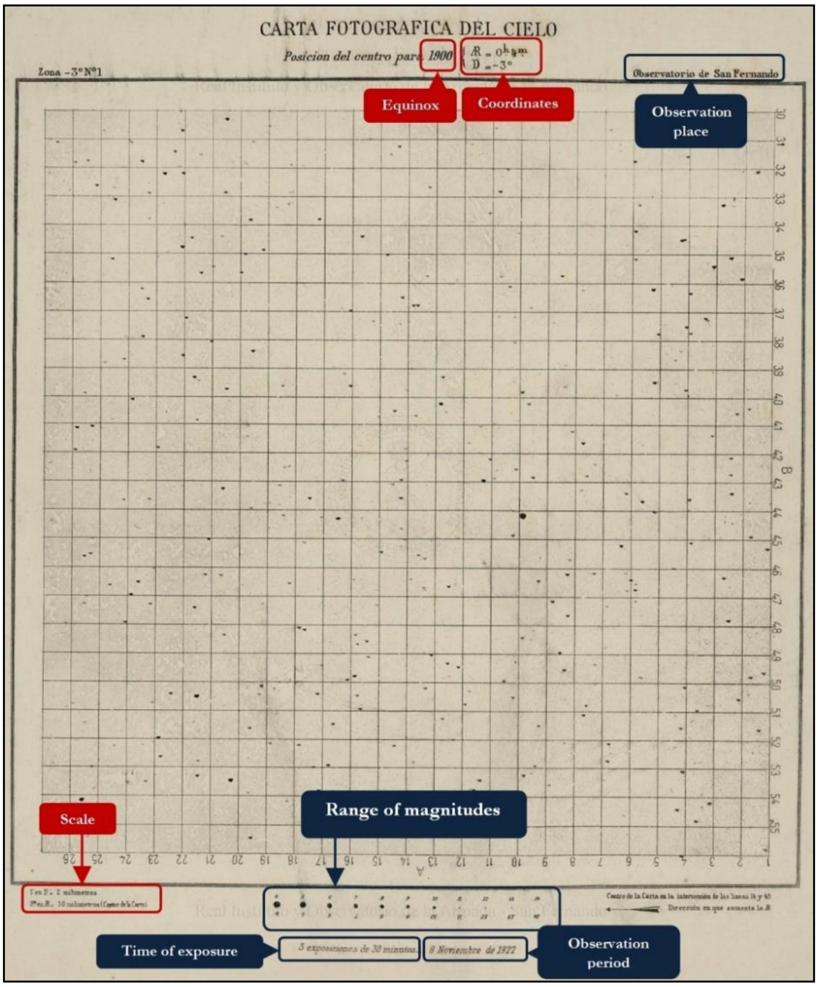

Figure 2. A star chart from the Carte du Ciel Project, showing in red the information which is provided for by the cataloguing standards as elements and, in blue, the information which is proposed to be declared as new elements. Source: Library of San Fernando Observatory, 1922.

As can be seen in the figure 2, most of the parameters are explicitly given in the chart, hence their registration is straightforward. However, other parameters not provided for in the image, can be easily deduced or identified in other sections of the atlas containing the given star chart. For instance, determining the hemispheres is an easy task if the coordinates (specifically, the declination) are known. As the declination of our star chart is negative (from -3° to -9°), it corresponds to the Southern Hemisphere, which we propose to register as a separate element. Moreover, the astronomical instruments element can be filled with useful information on the telescopes or the type of instrument used for star charting purposes. In our case, this information is given in related literature, i.e. in the introduction to the Astrophotographic Catalogue of the Carte du Ciel project as figure 3 shows.

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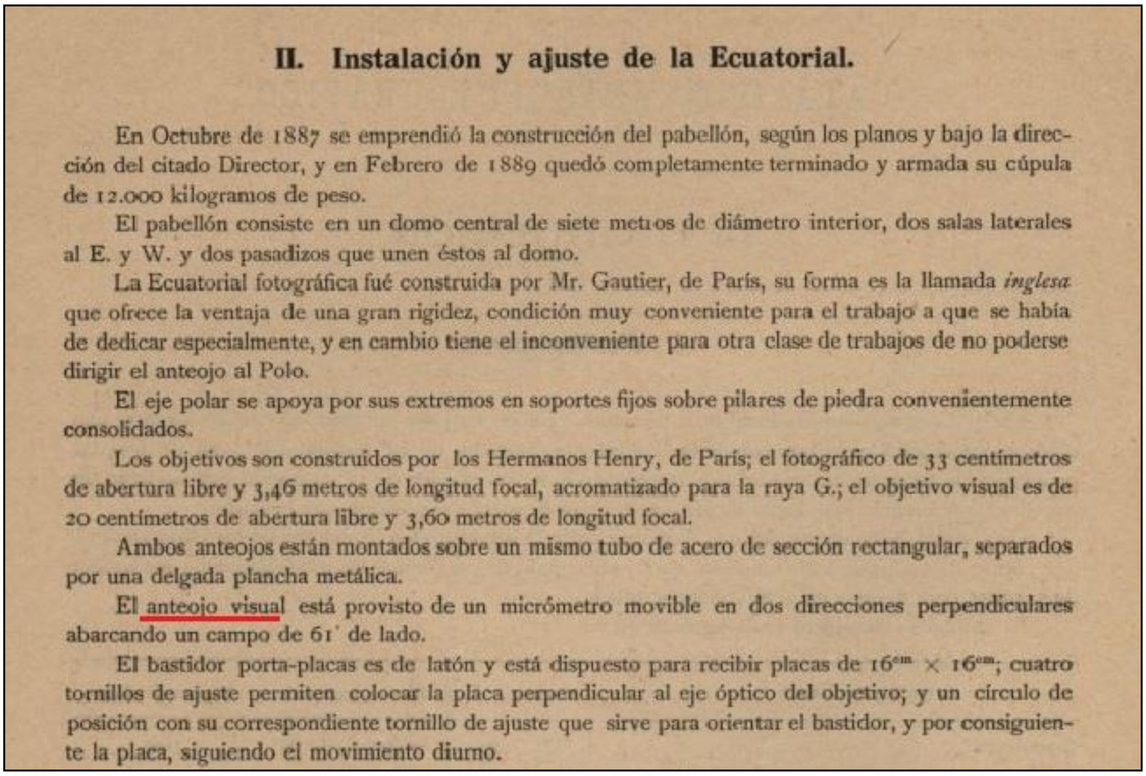

II. Instalación y ajuste de la Ecuatorial.

En Octubre de 1887 se emprendió la construcción del pabellón, según los planos y bajo la dirección del citado Director, y en Febrero de 1889 quedó completamente terminado y armada su cúpula de 12.000 kilogramos de peso.

El pabellón consiste en un domo central de siete metros de diámetro interior, dos salas laterales al E. y W. y dos pasadizos que unen éstos al domo.

La Ecuatorial fotográfica fué construida por Mr. Gautier, de París, su forma es la llamada *inglesa* que ofrece la ventaja de una gran rigidez, condición muy conveniente para el trabajo a que se había de dedicar especialmente, y en cambio tiene el inconveniente para otra clase de trabajos de no poderse dirigir el anteojo al Polo.

El eje polar se apoya por sus extremos en soportes fijos sobre pilares de piedra convenientemente consolidados.

Los objetivos son construidos por los Hermanos Henry, de París; el fotográfico de 33 centímetros de abertura libre y 3,46 metros de longitud focal, acromatizado para la raya G.; el objetivo visual es de 20 centímetros de abertura libre y 3,60 metros de longitud focal.

Ambos anteojos están montados sobre un mismo tubo de acero de sección rectangular, separados por una delgada plancha metálica.

El anteojo visual está provisto de un micrómetro movible en dos direcciones perpendiculares abarcando un campo de 61′ de lado.

El bastidor porta-placas es de latón y está dispuesto para recibir placas de $16^{cm} \times 16^{cm}$; cuatro tornillos de ajuste permiten colocar la placa perpendicular al eje óptico del objetivo; y un círculo de posición con su correspondiente tornillo de ajuste que sirve para orientar el bastidor, y por consiguiente la placa, siguiendo el movimiento diurno.

Figure 3. Instruments shown in the Introduction of Astrographic Catalogue from San Fernando Observatory.

Finally, Figure 4 illustrates the bibliographic record associated to this chart, where all the previous data have been recorded.

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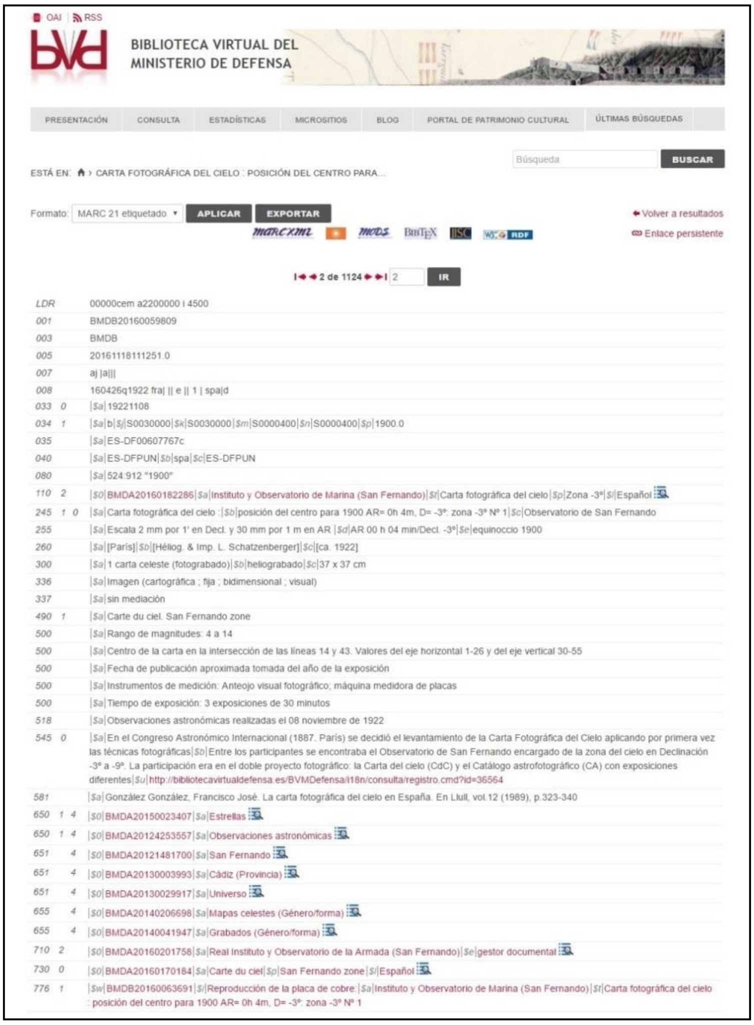

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OAI | RSS
BIBLIOTECA VIRTUAL DEL MINISTERIO DE DEFENSA
PRESENTACIÓN  CONSULTA  ESTADÍSTICAS  MICROSITIOS  BLOG  PORTAL DE PATRIMONIO CULTURAL  ÚLTIMAS BÚSQUEDAS
Búsqueda  BUSCAR
ESTÁ EN: > CARTA FOTOGRÁFICA DEL CIELO : POSICIÓN DEL CENTRO PARA...
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marcxml  mods  BibTeX  ISC  RDF                          Enlace persistente
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001       BMDB20160059809
003       BMDB
005       20161118111251.0
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008       160426q1922 fra| || e || 1 | spa|d
033  0    |$a|19221108
034  1    |$a|b|$j|S0030000|$k|S0030000|$m|S0000400|$n|S0000400|$p|1900.0
035       |$a|ES-DF00607767c
040       |$a|ES-DFPUN|$b|spa|$c|ES-DFPUN
080       |$a|524:912 "1900"
110  2    |$0|BMDA20160182286|$a|Instituto y Observatorio de Marina (San Fernando)|$t|Carta fotográfica del cielo|$p|Zona -3º|$l|Español
245  1 0  |$a|Carta fotográfica del cielo :|$b|posición del centro para 1900 AR= 0h 4m, D= -3º: zona -3º Nº 1|$c|Observatorio de San Fernando
255       |$a|Escala 2 mm por 1' en Decl. y 30 mm por 1 m en AR |$d|AR 00 h 04 min/Decl. -3º|$e|equinoccio 1900
260       |$a|[París]|$b|[Héliog. & Imp. L. Schatzenberger]|$c|[ca. 1922]
300       |$a|1 carta celeste (fotograbado)|$b|heliograbado|$c|37 x 37 cm
336       |$a|Imagen (cartográfica ; fija ; bidimensional ; visual)
337       |$a|sin mediación
490  1    |$a|Carte du ciel. San Fernando zone
500       |$a|Rango de magnitudes: 4 a 14
500       |$a|Centro de la carta en la intersección de las líneas 14 y 43. Valores del eje horizontal 1-26 y del eje vertical 30-55
500       |$a|Fecha de publicación aproximada tomada del año de la exposición
500       |$a|Instrumentos de medición: Anteojo visual fotográfico; máquina medidora de placas
500       |$a|Tiempo de exposición: 3 exposiciones de 30 minutos
518       |$a|Observaciones astronómicas realizadas el 08 noviembre de 1922
545  0    |$a|En el Congreso Astronómico Internacional (1887. París) se decidió el levantamiento de la Carta Fotográfica del Cielo aplicando por primera vez las técnicas fotográficas|$b|Entre los participantes se encontraba el Observatorio de San Fernando encargado de la zona del cielo en Declinación -3º a -9º. La participación era en el doble proyecto fotográfico: la Carta del cielo (CdC) y el Catálogo astrofotográfico (CA) con exposiciones diferentes|$u|http://bibliotecavirtualdefensa.es/BVMDefensa/i18n/consulta/registro.cmd?id=36564
581       |$a|González González, Francisco José. La carta fotográfica del cielo en España. En Llull, vol.12 (1989), p.323-340
650  1 4  |$0|BMDA20150023407|$a|Estrellas
650  1 4  |$0|BMDA20124253557|$a|Observaciones astronómicas
651    4  |$0|BMDA20121481700|$a|San Fernando
651    4  |$0|BMDA20130003993|$a|Cádiz (Provincia)
651    4  |$0|BMDA20130029917|$a|Universo
655    4  |$0|BMDA20140206698|$a|Mapas celestes (Género/forma)
655    4  |$0|BMDA20140041947|$a|Grabados (Género/forma)
710  2    |$0|BMDA20160201758|$a|Real Instituto y Observatorio de la Armada (San Fernando)|$e|gestor documental
730  0    |$0|BMDA20160170184|$a|Carte du ciel|$p|San Fernando zone|$l|Español
776  1    |$w|BMDB20160063691|$i|Reproducción de la placa de cobre:|$a|Instituto y Observatorio de Marina (San Fernando)|$t|Carta fotográfica del cielo : posición del centro para 1900 AR= 0h 4m, D= -3º: zona -3º Nº 1
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Figure 4. Example of a complete MARC 21 record of the star chart shown in Fig. 2, where the new elements are included. Source: Biblioteca Virtual de Defensa (2017)

Final discussion and conclusions

Cataloguers are aware of the importance of adhering to standards in their usual practice, and much more at the current technological time when standards play an important role. If guidelines on content are not included in the standard, this only reflects its weakness, since that content could be useful for the library to provide the service required by its specialized users. The responsibility for this absence rests solely on the agency responsible for developing and producing such a standard.

A possible solution to address these needs while remaining inside the standard is presented by ISBD "unconstrained" ontology, through which properties that are not contained in the standard can be created as an extension of it, though they would not be controlled by it. However, this requires that these properties are declared by the library, with resources that not all libraries have. Moreover, for the same elements different properties could be created by different libraries, and this would not facilitate a more economic and efficient interrelationship and promotion of understanding, or science

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development. This solution would require further work on alignments and mappings to solve the differences between the individual approaches, hence increasing the economic cost of this information.

The alternative option is including all these specific requirements, controlled by the standard, built for a good understanding. It is a more economical solution that will increase the quality of the produced data, while proving the capacity of library standards to evolve, dialog with other standards, interoperate with them, and not maintain themselves isolated for librarians' management needs. This will confer increased value to information from libraries that will be able to interrelate with similar information coming from other sources, and will also demonstrate that library standards can be interesting for non-library institutions, as these can re-use the information contained in library resources.

As mentioned at the beginning of the present article, there are some fundamental and brand new standards (ICP, IFLA LRM, ISBD) that support the inclusion of elements necessary for specific users. Leaving out these elements could even be considered a wrong adaptation to the model (in the process of publication) and principles just recently approved.

The request to include the necessary changes in ISBD arrived just when ISBD Consolidated edition was being edited and published, in 2011. To conclude, the level of specialization of the content description of a resource should be proportional to its nature, since the more specialized a resource is, the more specialized their users' information needs are. Therefore, in this paper we advocate for a change of approach on the part of standard developers, requesting them to cater for more specialized metadata that will unquestionably satisfy the real needs of specialized users, and will allow them to achieve a much improved scientific information retrieval. In addition, it is important to highlight that librarians, documentalists and cataloguers must adapt to the needs and timings of technological developments, otherwise libraries could stop being useful services, risking to lose their traditional role of supporting and motoring for scientific, cultural and social development. Besides, it is important to note that standards must help us continue to support and foster communication and understanding between researchers, such as the astronomers, and librarians.

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