Astronomical Heritage, an important tool for education

El patrimonio astronómico, un importante instrumento para la educación

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Abstract

The sky and its lore have been always a historical heritage common to all the peoples and thus must be considered as an important cultural element. The European Union Institutions have considered a significant issue locating, studying and keeping for the future the historical places that have had an astronomical cultural relation, considering the information about the sky as a natural and cultural relation that has to be preserved.

Key Words: *Astronomy and culture. Astronomical heritage. European Union. UNESCO.*

Resumen

El cielo ha sido siempre un referente universal común a todos los pueblos, por lo que debe ser considerado como un importante elemento cultural. Las instituciones de la Unión Europea entienden que son significativos, y por ello dignos de preservar, los lugares que históricamente han mantenido alguna vinculación astronómica, propiciando su localización, estudio y protección.

Palabras Clave: *Astronomía y cutural. Patrimonio astronómico. Unión Europea. UNESCO.*

1. Introduction

Many people might wonder what connection might be between astronomical heritage and education. To be as convincing as possible we shall try to define both what means education and astronomical heritage, as well as the institutions which concur in their accomplishment.

- Education is the ensemble of measures systematically applied for the formation and development of the intellectual, moral or physical characteristics of the children and the youth, and by extension, of the people, society, etc. The result of this pedagogical activity should be a good development and a civilized behaviour in society.
- Astronomical heritage is the cultural aspect of astronomical patrimony, in which respects to the moral, intellectual, artistic goods transmitted from one generation to another.

A series of local, national or international bodies are trying to carry out these missions: 1) The Commission 46 of the International Astronomical Union (Astronomy Education and Development) seeks to further the development and improvement of education at all levels throughout the world, through various projects initiated, maintained, and to be developed by disseminating information concerning education at all levels. 2) UNESCO – the United Nations Educational, Scientific and Cultural Organization, which deploys its action in the fields of Education, Natural Sciences, Social and Human Sciences, Culture, Communication and Information. It seeks to encourage the identification, protection and preservation of the cultural and natural heritage around the world, considered to be of outstanding value to humanity. This is embodied in an international treaty called the *Convention concerning the Protection of the World Cultural and Natural Heritage*, adopted by UNESCO in 1972.

As you can see on the web page http://whc.unesco.org/en/activities/19, the tenets and goals of this new initiative are:

The cosmos has captivated the imagination of civilizations throughout the ages. The efforts of those cultures to understand or interpret what they see in the sky are often reflected in their architecture, petroglyphs, and other cultural representations.

The objective of the Astronomy and World Heritage thematic initiative is to establish a link between science and culture on the basis of research aimed at acknowledging the cultural and scientific values of properties connected with astronomy. The identification, safeguarding and promotion of these properties are the three lines of action for the implementation of this programme. Its goals are:

- *to offer a methodological framework for associated actions*
- *to open the pathway for cooperation between States Parties and academic communities and*
- *to share knowledge.*

The sky, our common and universal heritage, forms an integral part of the total environment that is perceived by mankind. Including the interpretation of the sky as a theme in World Heritage is a logical step towards taking into consideration the relationship between mankind and its environment. This step is necessary for the recognition and safeguarding of cultural properties and of cultural or natural landscapes that transcribe the relationship between mankind and the sky.

Properties relating to astronomy stand as a tribute to the complexity and diversity of ways in which people rationalised the cosmos and framed their actions in accordance with that understanding. This includes, but is by no means restricted to, the development of modern scientific astronomy. This close and perpetual interaction between astronomical knowledge and its role within human culture is a vital element of the outstanding universal value of these properties. These material testimonies of astronomy, found in all geographical regions, span all periods from prehistory to today.

As there are few properties related to science on the World Heritage List, and the scientific value of cultural properties related to astronomy is not always recognized, the World Heritage Centre, in close collaboration with the State Parties and ICOMOS, have developed the thematic initiative "Astronomy and World Heritage" in response to the ever-growing concept of World Heritage, and the Global Strategy for a Balanced, Representative and Credible World Heritage List adopted by the World Heritage Committee in 1994.

This Initiative provides us with an opportunity to identify properties related to astronomy located around the world, to preserve their memory and save them from progressive deterioration.

Support from the international community is needed to develop this activity which will allow us to help preserve this sometimes very fragile heritage.

Concerning the education the objectives are the accomplishment of a pilot project "Astronomy and

World Heritage in Young Hands"; the elaboration and implementation of educational projects based on a collaboration between UNESCO, Space Agencies, International Astronomical Union, international, national and regional bodies representing astronomy, archaeoastronomy and other relevant disciplines.

Finally, we have to mention the European Society for Astronomy in Culture (Société Européene pour l'Astronomie en Culture, SEAC (http://www.archeoastronomy.org/), which is *Professional Association of scientists working in the field of Astronomy in Culture or Anthropological Astronomy, including the interdisciplinary disciplines of Archaeoastronomy an Ethnoastronomy. However, researchers in nearby fields of science like History of Astronomy, Mythology, Spatial Archaeology or Cosmology are also welcomed in the SEAC*. The organization has two committees, one devoted to the education, and other to the Archeoastronomical heritage.

2. Why astronomy is belonging to the universal culture?

As there are few properties related to science on the World Heritage List, and the scientific value of cultural properties related to astronomy is not always recognized, a special committee was founded: Astronomy and World Heritage. This committee acts as a working group with the following mission:

- identification of archaeoastronomical sites;
- establishment of a database containing all relevant data needed for further research work, it encourages the protection of natural and cultural heritage related to the astronomy;
- encouraging authorities to nominate sites related to astronomy within their national territory for inclusion on the World Heritage List;
- encouraging participation of the local population, especially young people in the reservation of cultural and natural heritage related to astronomy;
- encouraging international cooperation in the conservation of our world's cultural and natural heritage related to astronomy.

Consequently, the youth are envisaged in the first place, as they are the most able to be in charge of the future preservation of the astronomical values accumulated throughout the centuries, or better said throughout the millennia. The better these values will be known the better they will be protected. The more the youth will know their future the better they will know to shape their future. And finally, the better they will understand the way in which knowledge of the universe has evolved throughout the centuries, the more they will learn about their place in the universe, about what they have to do in order to protect their planet.

A huge percent of what we know today about the universe has been achieved throughout history, without any of the present day techniques. How has this performance been possible? Due to the fact that man has thought about and has managed to understand what is going on around him. In such a high technology epoch as the present one it would be very dangerous not to resort to our knowledge in order to know the cosmos, leaving only technique to have its say.

Very many young people become computer addicted and no longer look at the sky with their own eyes, no longer cast a single glance, a single thought to the past in order to understand as well as possible where we come from and where we are going to.

Very many people consider absolutely natural what is going on around them and it does not even cross their mind that each discovery is the result of efforts of dozens, hundreds of years and even of millennia.

The tendency to exaggerate the role of technology for humanity can lead to serious errors, even to the destruction of the planet. Maybe it's time to look more wisely back towards the past, to stop for a minute and to wonder where we are going to. It's also high time to get closer to the big questions of the universe:

- Why is there something rather than nothing?
- Are there indications of purpose in the universe?
- Why is nature comprehensible to humans?
- Where do the laws of physics come from, and why do they take the form they do?
- How is the cosmos related to humanity?
- Does the universe have a beginning?
- Are the laws of nature fine-tuned for life? If so, what does it mean? How did the universe originate?
- What is the origin of the complexity of matter in the universe?
- What determines the values of the "fundamental" constants?

- What explains the large scale ratios of forces we observe?
- Does (the quantum mechanical) ensemble of universes exist? If so, how do we know?
- Does the multiverse exist? If so, can it be verified through scientific testing?
- If the multiverse exists, why does a particular multiverse exist rather than any other?
- Can cosmological space-time be infinite?
- Is our universe "finely-tuned" for life and intelligence? If so, why?
- Is there life on other planets? Are we alone in the universe?
- Where did life come from? Can other form of life exist?
- Why does the universe seem evolutionarily creative?

3. What should we begin with?

3.1. Identification of astronomical heritage

A first point would be the identification of this huge astronomical heritage which can be found in any point of the globe. Some discoveries are already famous; others are waiting to be unravelled.

As for the identification of astronomical patrimony, their values are very different:

- sites
- sanctuaries
- buildings
- sundials
- instruments
- drawings
- ancient books

Naturally, their identification is the key problem. Many are lost in inaccessible places, some are mistaken for worthless objects, and others are kept in unimaginable conditions, while others are considered lacking any connection to astronomy.

However, there comes an equally important stage: the classification and achievement of a database which is to become a "library" available to anybody who wishes to find out more about astronomy history, the culture and civilisation of a nation, region and even of humanity.

We have made a model of a database, together with Mihai Caramihai and Vasile Mioc, as follows (Figure 1). Object oriented databases (OODB) became visible around the mid 1980s. The goal then was to deliver a new breed of database, designed and optimized to store and manipulate objects. This goal was driven by the widespread adoption of object-oriented modelling techniques and languages.

Design decisions made at this time differentiated object databases from existing relational databases. Instead of focusing on a data model (based on a fixed set of types) specified in some abstract, normalised form, the object database focused on the object model as defined within the O-O language. Figure 1 shows a typical ODBMS architecture. Object databases are optimized for this navigational access and the grouping of objects between the database server and client

3.2. The data warehousing concept

Most of the on-line resources available to the people interested in historical aspects are simple archives characterized by queries based on observational parameters, and it is still difficult to correlate objects in different archives or access multiple catalogues simultaneously

To answer directly to particular scientific issues, a *scientific archive* is needed. This kind of archive can be developed structured on three paths: 1) scientific parameters, 2) easily discover the object types in the archive and the available properties, and 3) constraint on scientific properties with the desired level of detail.

In order to develop a database focused on archaeological information, the following key requirements are needed: 1) Flexibility, because all data are rich in structure, and it is necessary to protect proprietarily rights, to allow for changes/enhancements in design; 2) Scalability, with ~0.5 Tbytes of new data per year and the need to maintain performance for increasing data volumes; and 3) Portability.

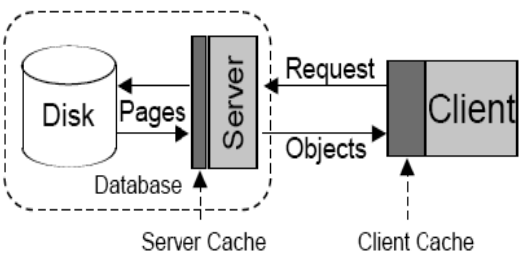

Figure 1.- A standard client / server architecture of an OODB.

The abovementioned requirements can be satisfied organizing the data in a data warehouse, subject oriented, integrated, time varying and non-volatile data collection. Hence, data must be arranged in a structure that can be easily explored and queried (i.e. fewer tables and keys than the equivalent relational model)

Strictly speaking an "astronomical heritage database" is not History. Hence facts, objects and sanctuaries are not in themselves "History." A popular myth is that History is all about facts and the past. But interpretation is needed to push facts into the realm of reality and usefulness. A database oriented to archaeology does not attempt to interpret facts, but is intended as a database: in other words, the gathering together of facts with the main goal to identify, preserve and / or rescue threatened objects. It is intended as a research tool and aid for the researcher, interested and inquisitive person. It is ultimately up to you to make the facts come alive through interpretation and by adding meaning to them.

The reasons why a web site can be chosen as a medium for the database are several: 1) It is easily accessible by everybody who has access to the Internet; 2) The information is always current, i.e. new information is made available and omissions are rectified as fast as it takes to process the data; and 3) A web site can be a fantastic public medium: different point of views & new interpretations can be made public easily.

3.3. The goals

To design a database for anything that is of historical value to cultural heritage this would include: 1) Instruments: any instrument made, used or possessed by an astronomer or an observatory; 2) Written sources: primary (oral sources to be documented); secondary; and tertiary; and 3) Remaining artefacts: places; plaques & statues; pictorial sources, and physical objects.

We try to give below an example of the data necessary for the inclusion of an object into such a database. We believe that the most suggestive model for us can be no other than the famous Dacian sanctuary at Sarmizegetusa Regia, situated on the Romanian territories.

Dacian sanctuary at Sarmizegetusa Regia
Site type: sanctuary
Precise location
Country: Romania
Province or Region: Gradistea de Munte
Village: Orastioara de Sus commune, Hunedoara county
Name of the asset: Sarmizegetusa Regia – the capital of the Dacian kingdom.
Geographical coordinates:- Latitude 47°27' - 45° 497' North, - Longitude 23°09' - 29°31' East,- Altitude 1200 m
Short description
It the most important Dacian military, religious and political centre. Erected on top of a crag 1200 meters high, the fortress was the core of the strategic defensive system in the Orastie Mountains, in Romania, comprising six citadels. The fortress, a quadrilateral formed by massive stone blocks (*murus dacicus*), was constructed on five terraces, on an area of almost 30,000 m². It also had a sacred precinct — among the most important and largest circular and rectangular Dacian sanctuaries the famous Circular Calendar Sanctuary is included.
Some photos: (see figures 2 and 3)
Selected bibliography
Dramba, I., *History of the culture and of the civilization*, vol. 1, Ed. stiintifica si enciclopedica, Bucuresti, 1985 (in Romanian)
Floca, O., *Le musée archéologique de Sarmizegethusa*, ed. Meridiane, Bucarest, 1969
Rodean, I., *The enigmas of Sarmizegetusa's stones*, Ed. Albatros, Bucuresti, 1984 (in Romanian)
Selected links
http://www.geocities.com/cogaionon/pictures.htm
http://www.clubtravelescu.ro/romanesc.php
http://www.cimec.ro/Monumente/UNESCO/UNESCOen/index2C61.htm
Ancient books
Sa luam acum un exemplu total diferit. Cum pot fi inventariate carti vechi, de importanta deosebita pentru astronomie.

We will refer now to a totally different example, namely to the way in which **old books**, of a special importance for astronomy, can be archived:
Author: Hrisant NOTARAS
Title: Introduction ad geographiam et sphaeram
Publishing house: Not mentioned
City: Paris
Year of publication: 1716
Short description:176 files and 2 plates.

On the file 1, verso, is the portrait of the author. On the file 2 the Greek title and on the file 3 the Latin one:

Chrisanti Notara presbyteri et arhimandritae sanctissimae patriarchalis et apostolicae sedis Hierosolymae. Introductio ad geographiam et spheram. In gratiam illustrissimi, ac spectatissimi Domini Scarlati Maurocordati, dignissimi filii celsissimi, piisimi et sapientissimi Domini Ioannis Nicolai Maurocordati principis ac Domini totius Vallachiae.)

Further editions or translations: No one

Where could it be found?: Library of the "Al. I. Cuza" University, Jassy, Romania
Library of Antim Monastery, Bucharest, Romania

Extremely important information concerning the history of astronomy has been stocked for years on **photographic plates**.

Many solar system objects were discovered by using photographic plates, superseding earlier visual methods. Discovery of minor planets using photographic plates was pioneered by Max Wolf beginning with his discovery of 323 Brucia in 1891. In 1898 the first natural satellite, Phoebe, was discovered using photographic plates. Pluto was discovered using photographic plates as well as its moon Charon, which was discovered by examining a bulge in Pluto's image on a plate.

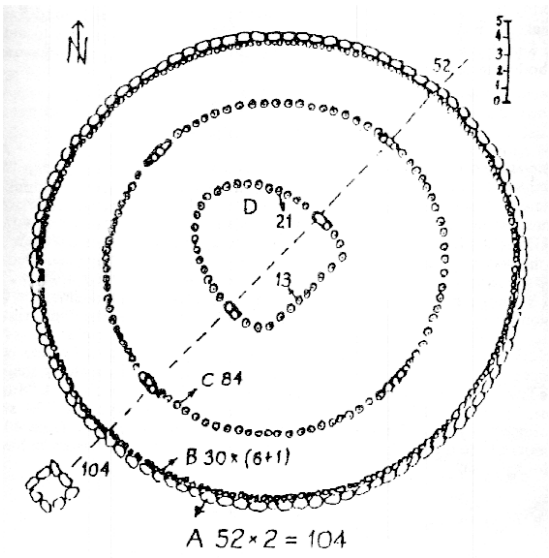

Figure 3.- The sacred area- The large circular sanctuary (details). The Andesite Sun.

Figure 2.- Sarmizegetusa Regia - the sacred area. Paved square and the large circular sanctuary.

A huge work is carried out today throughout the world for the digitalization and achievement of the greatest archive of photographic plate ever made: more than 2,200,000 plates obtained with professional telescopes of 125 observatories world-wide, stored in 414 archives. Naturally, this work has not been finalized yet and the huge volume of information stocked is only at the beginning of its capitalization.

Maybe other types of databases have not achieved so much. We refer to the drawings made up to the use of the photographic plates in many observatories (to mention only those of Schiaparelli) or to the sundials, various types of instruments and so on.

4. The astronomical information stocking: a few examples

Let us analyse several ways of astronomical information stocking. They might be classified into: necropolis, sanctuaries, statues of astronomical significance, sundials, symbols preserved in the architecture of village houses (gates, window frames).

4.1. Neolithic cemeteries

For instance, there is information about the culture on the Romanian territories dating even from the Neolithic. Yet this epoch is characterized by an impressive number of necropolises: Cernica, Parța, Iclod are only a few names that have entered national, as well as universal history. The Sun cult is evident from tombs orientation to sunrise on funeral day to cult objects still preserved, on which the cosmic elements are very numerous, the Sun being the most important one of them.

4.2. Dacian sanctuaries

Much later, in the epoch of the Dacians and of the Roman Empire, the native population found protection and inspiration especially in the mountains. The Meridional Carpathians still preserve an impressive number of sanctuaries, with a complex role: religious, of defence, of community gathering, etc. Some of them are to be found at Costeşti, Piatra Roşie, Aninеş, Grădiştea Muncelului, built about two millennia ago.

The best known seems to have been the latter one, as there was also the capital, namely Sarmizegetusa Regia. This is maybe the best illustration of the epoch's knowledge level. It dates from a period of flourishing culture and civilization strongly influenced by the Greek-Romans, predominant at that epoch. The entire six fortress —Sarmizegetusa, Blidaru, Piatra Roşie, Costeşti, Căpâlna and Baniţa— that formed the defensive system of Decebalus are part of a UNESCO World heritage site.

4.3. Churches

As we have mentioned tombs orientation, we have to point out that this tradition is strongly rooted on the Romanian territories and that churches are the most eloquent proof to this effect. They preserve an extremely rigorous orientation, not only towards sunrise but more specifically towards the sunrise on the patron's day. Something like that could not have been solved without a precise knowledge of the daily motion of the Sun and without a well established calendar. Actually, as all over the world, timekeeping and especially the calendars must have been as many reasons for observing the celestial vault of heaven and for establishing some rules, many times very original and extremely ingenious.

The ancient dwelling places built in the villages are part of the same tradition. Unfortunately, this is more an oral tradition because, on account of the materials used, most frequently of wood or clay), the houses preserved are no more than two or three centuries old. In this case, too, there was a preference for the sunrise direction, the Sun being often represented on the outer walls of the house, windows or doors frames, as well as on the gates.

4.4. Sundials

Sundials are a special category because there is no country or county where this kind of "instruments" for timekeeping should not have been preserved. Some of them must have been built above the ground, but these have scarcely survived.

Naturally, they indicate solar time flow materialized through the passage of an object's shadow (sometimes only a stick) across a surface (generally plane) on which there are a lot of time indicating divisions. Generally, the object leaving behind a shadow is an axis inclined parallel to the Earth's rotation axis or the world's axis. Naturally, the inclination angle depends on the place latitude.

The shadow passage throughout a day is connected to the apparent motion of the Sun on the vault of heaven, namely indirectly to Earth's rotation, which gives us the length of the day. Consequently, the hour indicated by the solar dial is the true solar time of the place where it is situated. Only that this hour differs from the legal time we all use for various reasons, namely:

- solar day varies depending on the seasons: it is a variation translated by means of the time equation
- One must also take into account the place longitude and maybe the system of meantime zones, to say nothing that lately, whoever wishes to built such a „clock" must also take into account the summer time.

Naturally, such a "clock" functioned only during daytime and only in clear weather, although the Moon's shadow throughout the night allowed the identification of the true hour if one took into account a correction depending on the Moon's age.

Anyway, sundials were sufficient for many centuries for time orientation. The oldest sundials were found in Egypt (simple height dials). It is also worth mentioning the European canonical dials introduced by the Venerable Bede, which allowed the transition to the sun dials with inclined stick, introduced by the Arabians around the 13th and 14th centuries.

In conclusion, sundials are very important to astronomy history and that is why they should be identified and launched in databases which should mention their place, geographical coordinates, owner, constructor, description, pictures, etc. Furthermore, such a database would allow the young people to improve their knowledge about the region they live in, about the scientific knowledge level of the old area inhabitants and might even lead to the discovery of authentic masterworks.

4.5. Astronomical Observatories and old Instruments

The oldest observatories served the needs of agriculture, astrology and time measurement. At Nabta Playa (Egypt) one of the oldest astronomical observatories in the world was discovered. It is an important megalithic field, 6000-6500 years old, which is a millennium older than the one at Stonehenge (England) and contemporary with the circle at Goseck (Germany). It could be called a "stone observatory". It is, actually, a prehistoric calendar that marks the summer solstice with a high precision.

However, the most famous megalithic observatory remains that of Stonehenge. The archaeologists had believed that the iconic stone monument was erected around 2500 BC. But the surrounding circular earth bank and ditch, which constitute the earliest phase of the monument, have been dated to about 3100 BC. Stonehenge is the result of an oral culture, in other words it is its creators' means of "writing" history. Many aspects of Stonehenge remain subject to debate.

There is a long list of other ancient observatories: Chankilo in Peru, El Caracol in Mexico, Uijain in India, Arkaim in Russia, Angkor Wat in Cambodia, Kokino in the Republic of Macedonia, the Goseck circle in Germany, Cheomseongdae in South Korea, etc. We could also add the sanctuary at Sarmizegetusa in Romania, which undoubtedly was also an observatory.

When speaking about astronomical observatories meant for sky observation, one must not overlook those introduced by the medieval Muslim astronomers. The Islamic observatory was the first specialized astronomical institution with its own scientific staff, astronomical program, astronomical instruments and special buildings. They can be assimilated with genuine scientific research institutions as long as the theoretical investigations were accompanied by astronomical observations.

Maragheh Observatory was founded in the 13th century. In 1420, Prince Ulugh Beg, himself an astronomer and mathematician founded another large observatory in Samarkand. In the 16th century a new observatory was built near Delhi. Worth mentioning are also the Baghdad Observatory (Iraq), Beijing Ancient Observatory (China), Stjerneborg and Uraniborg (Sweden).

In the 15th century, namely a century before Tycho Brahe built the observatory at Uraniborg in Sweden. Georg von Peuerbach established in his "Tabula Varadiensis" (in latin Oradea = *Magnovaradinum*), the town's observatory as lying on the prime meridian of Earth. Actually, this is the oldest one on the Romanian territories.

The identification of other astronomical observatories is extremely important in the history of a people, of a civilization. In order to catalogue them one has to mention the place, coordinates, construction stages, instruments existing or preserved in various museums of the world, description, plan and pho-

tos, as well as some of the books where the observatory is mentioned.

4.6. Pictography

If image has always been a proof of the epoch when it was made, when it comes to storage it has the disadvantage of deterioration in time, especially as far as the distant periods are concerned when the techniques did not allow the fixing of colours on various materials.

There is an impressive variety of materials on which cosmic symbols were drawn. Each one deserves a special study, but as with the other fields of astronomical information stocking, we shall just briefly mention them. There are drawings on stone, ceramics, leather, parchment, wax, jewels, and even painted eggs for Easter that have many cosmic symbols, especially the Sun and the Moon, but also comets or constellations. Metal is also a proof of astronomical knowledge, especially as its durability has allowed it to preserve better; some examples are the Dacian shields, coins, medals, or iron nails.

Of a special interest with the Romanians are the icons, especially those painted on glass. Besides the fact that they constitute true works of art that begins to be slowly included into the world patrimony, there is yet no special study on the topics of the iconography represented, especially as many of the religious themes contained refer either to the Christmas Star or to other events of cosmic connotation.

An attempt to classify cosmic representations was begun in a less studied chapter even at the world level. It concerns blazons and seals. The heraldic language uses man, animals, arms, but also heavenly bodies. The Sun, Moon, terrestrial globe, the stars are symbols frequently represented on the blazons of the Romanian rules, beginning even with the 14th century.

However, Romanian civilization has another exceptional iconographic part, very rare throughout the world, namely the exterior frescos of the Moldavian monasteries. Because of the harsh climate of the region, ranging from Eastern winds to high temperature or humidity variations, the colours have been hardly preserved throughout the centuries. The fact that some of them still hold on, at least the sky blue on the fresco of Voronet monastery, is still a mystery even nowadays.

It is interesting to note, from the point of view of the present study that these frescos were the compositions of modest painters, often local people. As far as we know, they were never trained at any Romanian colleges or universities. An additional proof of the fact that the monasteries held the supremacy of Romanian culture for whole centuries and that they held an important culture is the representation on the walls of the monasteries of some portraits of ancient philosophers, well-known for their cosmological theories as Aristotle or Plato.

Inside the churches, in the pronaos (the first room) it is by tradition the church calendar which begins on 1 September, namely a sequence of icons in keeping with the lay calendar from the religious point of view. Naturally, this implies an old effort of time measurement as accurate as possible, maybe the oldest one in the field of astronomical knowledge.

Drawings or comic symbols can be identified on all types of materials ranging from tapestries or frescoes to metals. Naturally, the best known is the Bayeux Tapestry (Normandy, France), which depicts the passage of comet Halley in 1066 as a fiery star, and the accounts that have been preserved represent it as having appeared to be four times the size of Venus, and to have shone with a light equal to a quarter of that of the Moon.

However, throughout the world there are other, less known frescoes, which show that cosmos knowledge was an important cultural component. I shall also give examples from Romania's territory, which are more familiar to me. Thus, many of the monasteries in Northern Moldavia are decorated with frescoes of an invaluable quality (one of them, Voronet, is under UNESCO protection), which have resisted the adverse weather conditions due to painting formulas still undiscovered. Painted in 1457, one of the preferred topics is the presence of some philosophers, known for their cosmological theories (Plato, Aristotle, etc).

Another interesting representation from the as-tronomical point of view is the painted orthodox calendar (succession of paintings representing every saint patron of the year's day, starting with September 1, at the beginning of the Christian calendar). At least in the orthodox churches this makes up a tradition.

One must not overlook the abundant zodiacal symbols on various representations in churches or on books. Finally, other materials on which cosmic symbols can be found are ceramics, glass (icons), leather, parchment, wax, jewels, silver coins, pain-

ted eggs (for Easter).The most frequent are the Sun, Moon, stars, comets, constellation symbols.

4.7. Oral storing

The need to find out more about everything that surrounds us, the unforgettable impression left by some cosmic phenomena, the need for orientation, for chronology control, all combined with the remarkable sensitivity of the population in this part of Europe, have made that folk tradition remains a thesaurus still little investigated as far as astronomical knowledge is concerned. Legends or names of stars and constellations are so beautiful that are still used even nowadays, even in the current language, in order to identify a celestial body.

Unfortunately, the beauty of the language used makes any translation worthless. We shall give, nevertheless, several examples, which reflect the ingenuity of the popular author:

Polaris = *Holy candle of the sky*, *pillar of the sky*
Aldebaran = *Piggish morning star*, *Awaker*, *Bull's eye*
Pleiades = *The hen with its brood*, *The little hen*
Cassiopeia = *God's throne*, *Monastery*
Auriga = *God's chariot*
Cygnus = *Great cross of midnight*
Orion = *The three Kings*, *The plough with harrows*,
Perseus = *Devil's chariot*, *The hatchet*
Milky Way = *Grove of the Sky*, *Trajan's path*, *Way of slaves*

4.8. Astronomy and heraldry: Blazons and Seals

What is heraldry? It is the science that studies the blazons and their art (herald = harbinger). It seems that the first blazons appeared only in the 10th century. This can be accepted only *stricto sensu* because, what was the Sun's disk that appeared, at the ancient Egyptians, on the Sun God's head if not a primitive blazon? Even if we limit ourselves to the "official" blazons, we shall find a lot of cosmic images: the Sun, the New Moon, stars, and comets. There are studies that fully deal with the sense of each heraldic figure. As the blazon was the highest symbol of the family, it was to be expected that the cosmic symbol was the most frequent.

5. The scientific astronomical archives

5.1. Notebooks and drawings

The elements above have described the old patrimony which can still give important information both for the identification of rare phenomena observed on Earth and for the evaluation of the population's cosmos knowledge level. However, there are more recent documents which can already make up a true scientific archive, but which, unfortunately, have had the same fate as the others. There are observation notebooks still unread (observation copy books of the astronomers of the 19th and the early 20th centuries). Some of these have been discovered by chance in the libraries of other world observatories.

Scientific drawings (for example sunspots) are not always preserved in the best conditions, while the information they can bring about an epoch when photographic astronomy did not exist yet is very important. Photographic plates or observation films have just begun to be scanned and digitized and there are hopes that their analysis will allow a minute research of the events registered at that time. Within the frame of the international Wide-Field Plates Database Project, these plates have been archived. The aim of the project is to make an inventory all the wide field photographic plates ever obtained, over the world, to organize them in a database and to make easy the access to the data from the plates.

5.2. Ancient books

A special part in the capitalization of the cultural heritage is held by ancient books. Throughout the world there are libraries and also private collectors or amateur astronomers who have astronomy books that can be quite unique.

Their identification is still one of the major aims of cultural patrimony capitalization. Of the utmost importance is not only their classification (their presence in a library means also a classification in keeping with the international standards) but also the evaluation of their condition. Humidity, excessive heat, the presence of pests (insects or other animals) or simply the owners' lack of interest can bring serious prejudices to the preservation of patrimony books.

5.3. Preservation state

A less complicated problem is their preservation state. It can be classified as follows:

1) **Good**. This is the state we appreciate for the way in which photographic plates have been preserved (at least those at Bucharest Observatory, where there have not been too high humidity and temperature variations). At present a systematic digital archive has begun within the international working group Sky Archive. Many documents have been preserved in very well organized libraries (controlled light and humidity, while their photocopy is made with utmost care). There is also another concern, this time of the museums, for a professional restoration of artworks

2) **Medium**. In this category can be included in the first place photographic plates stored in rooms with normal humidity, but uncontrolled light, dust, temperature. However, in the same state are also a series of artworks restored within the limits of financial conditions. In the conditions of quite severe financial restrictions, the first budget reductions are usually directed to what is "old" and "obsolete". This is many times the reason why the necessary funds for most of the conservation and for the setting up of a true astronomical museum, which Romania does not have yet, are very hard to find. Although there is a hall of 200 square meters, used until recently for meridian observations, where some objects of historical value have been stored through the local efforts. Gathered, their systematic presentation needs an adequate financing. It is useless to state the importance such an endeavour would have for the education and conscience of a society with claims to be truly civilized.

3) **Bad**. Unfortunately, as we have already mentioned, many valuable objects are at least in a bad state. We have mentioned drawings preserved in inadequate conditions, old books photocopied unprofessionally. Which is worse, and also unprofessional, and sometimes even of a unqualifiedly negligence has been the restoration of sanctuaries which already belong to universal culture, like the one at Sarmizegetusa. To say nothing of the fact that the zone where it is situated is utterly unprotected against tourists invasion, unauthorized constructions or questionable excavations.

Last but not least, we have to mention the commerce with patrimonial artwork (ancient vestiges, icons on glass, etc.) and the indifference or contempt to real cultural values

6. Conclusions

Proper scientific information is intended to shelter a population already puzzled from the unjustified fear it undergoes more and more frequently. The person, who knows the Universe realizes its significance as a human being, realizes that he must protect his planet, and realizes that if the atomic race will continue, a time will come when it will succeed to really destroy his own planet, much before its natural end.

A known astronomical event associated to a historical event helps to date the latter one and reciprocally to understand the old (ancient or medieval) mentality. This is achieved through the connection between celestial phenomena and terrestrial events, the social calamities: wars, change of rulers, mutinies, death of prominent personalities, etc., and the natural calamities: earthquakes, flood, weak harvest, grasshopper invasions, plague, drought, epizooties, etc.

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