



## INTERDISCIPLINARY STUDIES OF ANCIENT AND THE MOST ANCIENT HERITAGE SITES IN THE GEOGRAPHY OF CULTURE

**A. Paranina<sup>†</sup> --- Al. Grigoryev<sup>2</sup>**

<sup>†</sup>Herzen State Pedagogical University of Russia, St. Petersburg, Russia

<sup>2</sup>A. St. Petersburg State University, Russia

### ABSTRACT

*Ancient and the most ancient heritage sites are revered landscapes or their components (rock sculptures, geoglyphs, sacred hills, trees, aquatic complexes and other objects of natural, anthropogenic and mixed origin), which are usually associated with folk traditions and legends. Authors of the article relate inclusion of such objects in the cultural landscape to prehistoric times (the Stone Age and earlier), and as the main primary function allocate astronomical orientation in space-time. The article shows examples of possible instrumental use of well-known and respected sites on the example of the earth's surface arched sculptures located in different regions of the world. As a result of studies carried out on the basis of maps, satellite images, photos, published descriptions, the authors conclude that most of the objects served as elements of information support systems, were included into the ancient local and regional navigation network and represent key parts of the organization of geo-cultural space, that was the objective basis of their sacralization.*

**Keywords:** Objects of natural and cultural heritage, The co-creation of man and nature, Orientation in space-time, Navigation, Astronomical and geodetic network.

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### Contribution/ Originality

The author's concept of navigation model operation of the world opens new opportunities of reconstruction of primary rational purpose of ancient objects of cultural heritage. It is shown that the sacral sense and an esthetics of objects are bound to their informational (instrumental) function in a life support system.

### 1. INTRODUCTION

In geography, culture (cultural geography), objects of natural and cultural heritage are considered as the elements of the geo-cultural space. Features of geo-cultural space, as a result of a comprehensive - the physical and the essential development of the geographical environment are best presented in the definition of V.N. Archer, in which "geo-cultural space serves as frame, scope, context and product of human activity. It can be viewed in two different ways: 1) a study of culture in geographic space (spatial differentiation of the elements of culture - like artifacts and mentifacts, their expression in the landscape and the connection with the geographical environment, as well as the processes and results of spatial self-organization of entire cultural complexes and their media - communities of people with traditional, over-biologically elaborated, sustainable patterns of thought and behavior); 2) a study of geographical space in culture (identification of specific attributes that characterize the notion of geographical space in different cultures and cultural contexts, descriptions and comparisons of images of different

areas and territories, study the relationship of local communities to the natural and social environment in which they live)" (Streletsky, 2005).

As can be seen, in the understanding of culture as a form of collective experience in the development of nature, geography is close to the biological sciences, where it is shown that any species in the process of adaptation, not only adapts to the environment but also creates it. This explains the need for the simultaneous study of two inseparable areas of interaction between man and nature - "landscape culture" and "culture in the landscape".

Interdisciplinary studies of ancient heritage sites in cultural geography are based primarily on the achievements of physical geography, systematic approach in general and the doctrine of geosystems of V.B. Sochava (Paranina, 2010). The potential of physical geography in interdisciplinary research of culture is revealed through the well-known definition of the structure and functioning, dynamics and evolution of the Earth's nature, regional specificity which is reflected primarily in the characteristics of material flows, energy, information (Kalesnik, 1970). The following system provisions are the most effective: 1. The concept of geo-system structure as its spatial and temporal organization (Isachenko, 1991) 2. The idea of the constructive role of super-systems (Dyakonov, 2007) 3. The flow system as the basis of stability (Armand, 1988) 4. The flow of the structure-function (Viktorov, 2006) 5. Territorial networks (Rodoman, 1999).

A special role in our research of ancient heritage sites, as elements of geo-cultural space, belongs to the studies of V.I. Paranin on historical geography, including the conclusions: 1. on toponymic labeling of elements of territorial systems based on the orientation of the sun; 2. mapping models of Geospace rhythm of natural processes (such as the 1850 summer humidification cycle); 3. the role of transport communications as flows of matter, energy and information, forming geocultural space (Paranin, 1990;1998).

The navigation concept of information modeling of the world, developed at the intersection of physical geography and the geography of culture, provides detection of measured quantitative correspondences in hierarchically structured system of "cultural object - accommodating space (information, geocultural, landscape and geographical and space)" (Paranina and Paranin, 2009;2014;2015;2016a;2016b).

## 2. OBJECTS AND METHODS OF STUDIES

Ancient and the most ancient objects of natural and cultural heritage - anthropomorphic and zoomorphic forms of relief, rocks with petroglyphs, menhirs and other types of megaliths entered the circle of culture geography research relatively recently (Paranin and Paranina, 2009; Grigoryev and Paranina, 2011; Grigoryev, 2015). It was promoted by several factors: 1. The development of tourism and tourist interest in the ancient objects, with a deficit of reasoned interpretation; 2. The absence in the existing areas of humanities research of methods applicable to the ancient sites and ancient cultural landscape level; 3. The development of methodological culture of the geography of the base due to the wide application of the system approach and close cooperation with the natural sciences (physical, evolutionary geography and landscape science, geology, ecology, optics, astronomy, and others).

The objective complexity of their humanitarian research methods due to: 1. Lack of written evidence (refer to the prehistoric, i.e. nonliterate period of development of culture); 2. Unique and significant degree of destruction of natural and anthropogenic processes; 3. Transformation of the estimates as a result of evolutionary and revolutionary changes in the socio-cultural paradigm for thousands of years. These circumstances limit the ability of standard descriptive and comparative methods of art, as well as the use of methods of reconstruction "from the top" (the level of a modern understanding of natural sources).

In the process of developing the concept of navigation information modeling of the world, based on the widespread practice of continuous movement and orientation, we proposed a methodological study of reconstruction "from the bottom" - the nature of the signs, knowledge, traditions (Paranina, 2010;2016). This design is based on the possibility of reproducing the spatial structure of an object that reflects a unique environment in a given geographical point of space-time. Comparison of calculated or empirical model with test objects of natural

and cultural heritage allows us to refine the dating, the primary use of the technology, semantics of the graphical and artistic design.

The general algorithm of the system-information analysis, developed on the facilities of Eurasia, includes the following steps: 1. study of the object by standard methods (measurement, description, comparison); 2. characteristics of the landscape (including the evolution of the climatic conditions during the Holocene geological and geomorphological features, including the dominant system in the fracturing of rocks and stretch lineaments - linear tectonic structures that are reflected in the landscape); 3. astronomical and calendar calculations paleo-astronomical azimuths of sunrise / sunsets and the moon, the height of the gnomon of a sundial-calendar and regulations midday shade seasonal (for geographical coordinates of the object, taking into account the differences in physical and astronomical horizon); 4. establishment of the correlations of the spatial characteristics of the object, of the landscape and astronomical figures recorded at this point; 5. comparison of instrumental features of the object with local and regional life support tasks in different historical era (including the location of the object in the analysis of the transport communications system) (Paranina and Parani, 2016b).

As an example of interdisciplinary studies of natural and cultural heritage, we consider arched morphosculpture. Natural arch – rock formations in a shape of the gates, arches, bridges or windows. Widely known Delicate Arch and Landscape Arch, Arches of the National Park, Utah (USA); Natural Bridge at Bryce Canyon National Park, Utah (USA); Daniel Boone National Forest, Kentucky, (USA); Natural Arch in Timna Park, Negev Desert, Israel; Rainbow Cave arch in the Galilee, Israel; Pravčická Gate (Czech Pravčická brána, German Prebischtor) - the biggest rocky gate Elbe Sandstone Mountains; Golden gate of Kara-Dag in Crimea (Russia). It is believed that the arches were formed by the dissolution or erosion of weathered rocks. But, at the same time, their association with the sun and other celestial objects is marked frequently. This article presents some results taken by the author attempts to analyze the navigation capabilities of arch structures of natural and artificial origin from ancient times to the present.

### 3. RECONSTRUCTION OF NAVIGATIONAL DESTINATION OF ANCIENT OBJECTS

#### 3.1. Prehistoric Park Complex Vercors (Rhone-Alpes)

“Dragon” (La Pierre Percée, French “stone with a hole”) mountain Aiguille (aguille - French ‘peak, or needle’) in France. The relationship of these objects is represented in the engraving of 18th century (Fig. 1). Arch ( $44^{\circ} 57' 54'' \text{N}$ ,  $5^{\circ} 45' 33.01'' \text{E}$ ) has the size of the lumen of  $3 \times 5 \text{ m}$ . According to one legend, it is a Dragon, absorbing the rays of the setting sun at the equinoxes. Mount Aiguille ( $45^{\circ} 50' 31'' \text{N}$   $05^{\circ} 33' 09'' \text{E}$ ) is the highest of erosional outliers of Vercors plateau (altitude - 2086 m above sea level, the excess over the bottom of the basin – about 1000 m, height of column - about 400 meters).

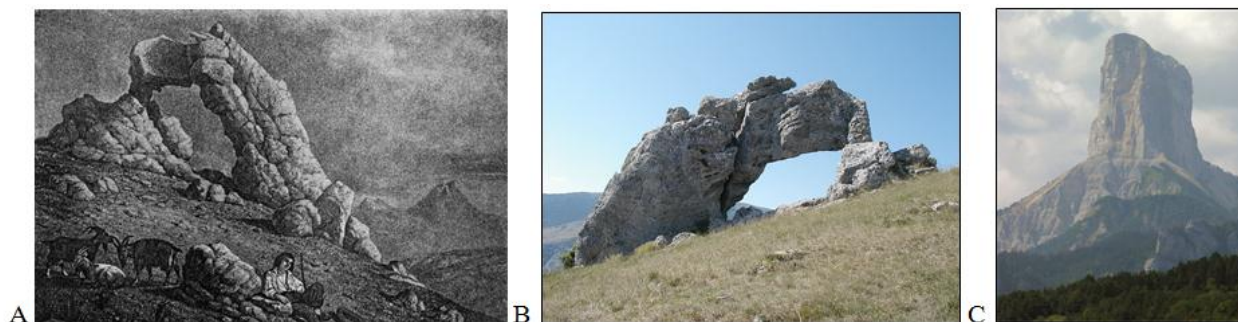


Fig-1. La Pierre Percée on an engraving of the XVIII th century (A) and photography (B); Mount Aiguille (C)

Source: [https://commons.wikimedia.org/wiki/File:La\\_Pierre\\_Perc%C3%A9e\\_\(Dauphin%C3%A9\).jpg](https://commons.wikimedia.org/wiki/File:La_Pierre_Perc%C3%A9e_(Dauphin%C3%A9).jpg)  
<http://montaiguille.free.fr/index.htm>

Analysis of the location of objects on the territory shows that myths and legends preserve the memory of the real possibilities of their use in the past as horizon astronomical observatory. Using objects as a sighting system provides a good visual communication - the distance between them is 21.5 km, elevation = 864 m top of the mountain, composed of light limestone and towering over the surrounding areas, is highly visible high-altitude dominant. Azimuth direction "Stone Dragon - Mount Aiguille" is 230 °, which is only 5 ° south of the current situation in the sunset days of the winter solstice (Fig. 2). However, due to the fact that the change in position astronomically significant points of the horizon at this latitude is very slow, the age of the Astronomical Observatory can be estimated as more than ten thousand years.

Archaeological evidence shows the highest density of Stone Age sites near the mountain Aiguille (<http://primatologie.revues.org/docannexe/image/789/img-13-small480.png>). The reason for the high density of population and the need for navigation tools could serve as a location at the crossroads of water (rivers) and land (mountainous) regional highways leading to the Mediterranean Sea.



Fig-2. Line of solstice sight, connecting Rock Pierre-Chatel and Mount Aiguille, the Google satellite image  
Source: Google Earth

According to geologists, arched stone Pierre-Chatel was created by natural processes, but for a long time was maintained by the restoration of the locals (Séquier, 2010;2012). Thus, this site is both natural and man-made. In connection with the performance of the instrumental function, which plays an important role in the life support system, it can be assumed that the mountain Aiguille also has a man-made additions. Then its resemblance to the figure of the sphinx, facing the astronomically significant point of the horizon, is explained by co-creation of man and nature.

### 3.2. Stone Arches in the National Natural Park of Ecrins

There are rock sculptures of dragons as well in the Ecrins National Nature Park, located a few dozen kilometers from the Park of the Vercors. Du Vet (Fig. 3) is the most fully preserved among the four sites. According to geologists, it was formed in the shallow water and then after drainage area was modified by erosion ([http://geologie\\_patrimoine\\_matheysine.perso.sfr.fr/sites\\_remarquables/entraigues\\_archesvet.html](http://geologie_patrimoine_matheysine.perso.sfr.fr/sites_remarquables/entraigues_archesvet.html)).

Elemental analysis of the "dragon" in the geographical location of the area shows the possibility of using it as a tool of orientation in space-time. Axis "trunk" coincides with the meridian - hence, it can act as a gnomon sundial at noon shadow will fall on the same line (direction NS), in the morning shadow will deviate to the west, and in the second - to the east. Rotation of the "head", which forms an angle of 90 ° with the main body of the dragon figure, can serve as a calendar, mark the boundaries of the summer and the winter half of the year: at sunrise / sunset shadow "dragon" in the winter will be located north of this line, in the summer - the south. Stone arch under the "trunk" is convenient for viewing sunrises / sunsets equinoxes.

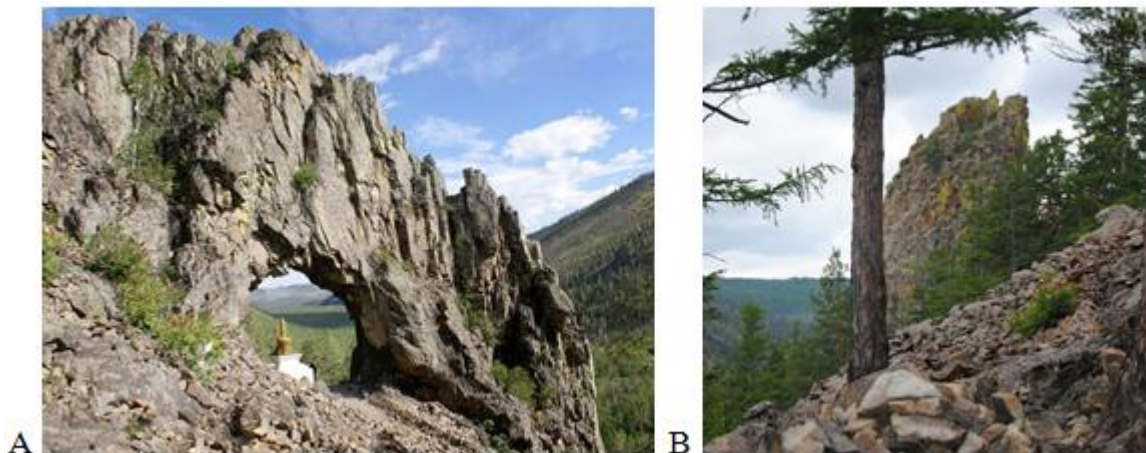


**Fig-3.** Zoomorphic arch - a stone dragon Du Vet, Park Ecrins, France  
Source: [http://geologie.patrimoine.matheysine.perso.sfr.fr/sites\\_remarquables/entraigues/archesvet.html](http://geologie.patrimoine.matheysine.perso.sfr.fr/sites_remarquables/entraigues/archesvet.html)

### 3.3. Natural and Man-Made Stone Arches in Different Parts of the World

Arched structures are universally recognized as the natural attractions and cultural elements and they are often complex, involving objects of different age, destination and origin.

An example is the revered rock Temple Gate (Uuden Sume) in the national “Alkhanay” Park (UNESCO Heritage Site, established to protect the places of worship of the Buryat people, Russia). Rock Temple Gate is located at an altitude of 1100 meters, it has a radius of about 6 meters clearance, recognized as natural. Under its dome there is a suburgan - a small Buddhist stupa, and the place was still in the pre-Buddhist cult times (Fig. 4 A). A few hundred meters north of the arch there is one of the revered object of this park - Dorji-Paghman (Diamond Princess) - a rocky remnant height of 12 m (Fig. 4 B).



**Fig-4.** Temple Gate (National Park Alkhanay, Russia), Dorji-Paghman (Diamond Princess)  
Source: <https://ru.wikipedia>

A retrospective analysis of analog objects of different ages and origins gives a better understanding of the technologies of instrumental use of ancient natural sites. Arched structures as instruments of sight position of the sun in the sky: 1. allow us to fix points of sunrise, sunset, and be the basis of the calendar; 2. note noon, playing the role of hours, i.e. combine the advantages of the ancient and most ancient navigation technologies (foresight in horizon observatory and back sight - shaped shadow and light spots). Examples of such forms created artificially, are known in the history of architecture, science and technology.

For example, the Gate of the Sun - (Inti Punku, Puerta del Sol), carved from a single block of gray-green andesite, are about 3 meters high, 4 meters wide and 0.5 m in thickness (Fig. 5). It is located in the temple of Kalasasaya, located near Lake Titicaca, on the plateau of the Altiplano (3825 m above sea level) in Bolivia. Archaeologist A. Poznanski called Kalasasaya a Temple of the Sun and the main construction of the Tiwanaku

civilization. He proved that it is a solar observatory and a stone calendar that corresponds to the astronomical situation of 15,000 years BC. The frequent archaeological remains of animals, extinct 12,000 years BC, confirmed this dating. The monumentality of the complex as a whole suggests that in ancient times the city was the center - performing metropolitan functions in the territorial system of the region.

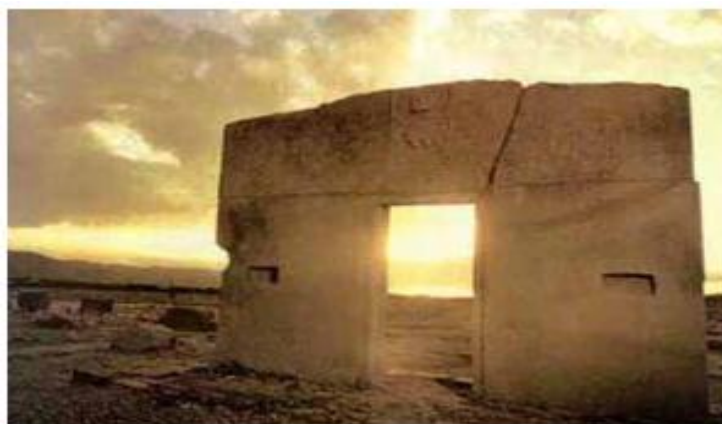


Fig-5. Gate of the Sun, Bolivia.

Source: <http://incrediblethingworlds.blogspot.ru/2016/04/gate-of-sun-bolivia.html>

The examples above show that the ancient stone objects - gates and arches, the most respected in their regions, were used as astronomical instruments. They are similar in shape to the natural predecessors - stone remnants created by the forces of nature and modified by humans in accordance with the instrumental task. In ancient times, the technology of construction of the entrance for viewing astronomical azimuth of the sun in the day, taken as the beginning of the year was widely used: the summer solstice in the temples of Ancient Egypt, mounds of Khakassia (Russia), the winter solstice in New Hill Grange (Ireland) equinox in the temple of Solomon, etc. (Stafeev and Tomilin, 2006). It can be assumed that the principle of the beam penetrating into the room on a specific day of the year, worked in famous labyrinths - Egyptian and copies thereof - of Crete (Knossos palace storerooms with vents located around its perimeter) (Paranina, 2010).

Obviously, as technologies advanced, astronomical instruments have become smaller and more accurate, and were made of metal, while stone arches lost their original function and became a symbol of the heavenly patronage and success (triumphal arch). In this context, ethnographic studies conducted by Pulkovo Astronomical Observatory in the republics of the Soviet Union at the end of the twentieth century, showed that the function of the tool orientation on a sliding beam of light relatively recently was carried out by the smoke hole in the roof and the entrances to the tent or yurt of nomadic peoples (Sundial, 1985). Recently, we recorded the memories of villagers about the similar usage of windows and carving on the window frames of houses in Karelia. Many options of using window openings and decorative elements of windows as a sundial can be seen in the central streets of St. Petersburg, founded 300 years ago, when all talented residents of the city, including the Russian tsar - Peter the Great were enthusiastic about gnomonics.

#### 4. CONCLUSION

Interdisciplinary studies of ancient heritage sites in the geography of culture enhance the possibility of objective understanding of their primary designation, symbolic interpretation of the structure and functions of geo-cultural space.

The objects of natural, artificial and mixed origin, including arches, spires and other forms of landscape sculpture can serve as: 1. well-defined markers of geographical space; 2. definition of time tools (sundials and calendars); 3. elements of information security in the organization of regional territorial systems and transcontinental communications.

Navigation functions of heritage sites are organically combined with their aesthetic qualities and recognized the symbolism (the connection of heaven and earth, the co-creation of man and nature).

The study of primary navigation designation of ancient and the most ancient natural objects, preserving traces of minimal artificial introduction, allow us to solve the same problem of geomorphology, evolutionary geography, anthropology and other related sciences connected with: 1. dating of natural events (glaciations, changes in the hydrological regime and landscape structure areas); 2. allocation of objective criteria for sacralization of objects; 3. definition of sapientation factors.

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## REFERENCES

- Armand, A.D., 1988. Self-organization and self-regulation of geographic systems. Moscow: Nauka Press. pp: 264.
- Dyakonov, K.N., 2007. Law of quantitative compensation functions in the biosphere of A.L. Chizhevskiy - "through" the geography of the law (The Space-Time Problem in Physical Geography). The development of ideas of A.L. Chizhevskiy in the life sciences, society and the world. Moscow: Helios Press. pp: 7-14.
- Grigoryev, A.I.A., 2015. Stone statues - indicators of development of the planet. Vestnik St. Petersburg State University Series 7, 2(58): 65-75.
- Grigoryev, A.I.A. and A.N. Paranina, 2011. Cultural geography: The step to the basics? Vestnik St. Petersburg State University Series 7, 3(42): 50-64.
- Isachenko, A.G., 1991. Landscape and physical-geographical regionalization. Moscow, Higher: Wk Press. pp: 366.
- Kalesnik, S.V., 1970. Common geographic patterns of the earth. Moscow: Thought Press. pp: 283.
- Paranin, R.V. and G.N. Paranina, 2009. The labyrinth: orientation in geographic space and the evolution of the mark. Proceedings space geocultural European North: the genesis, structure and semantics. Materials IV Pomeranian readings on the semiotics of culture (Arkhangelsk-Pinezhsky Reserve, 7-11 July 2008). Arkhangelsk: State Pomor University of Russia Press. pp: 516-518.
- Paranin, V.I., 1990. Historical geography of the chronicle of Russia. Petrozavodsk: Karelia Press. pp: 152.
- Paranin, V.I., 1998. The history of the barbarians. St. Petersburg: RGS Press. pp: 283.
- Paranina, A.N., 2016. Gnomon as sources of information on planet rhythms. Journal of Geomate, 10(20): 1815-1821. [View at Publisher](#)
- Paranina, A.N. and R.V. Paranin, 2009. Interaction of the nature and ancient persons on the coast of the White Sea. Journal of Wetlands Biodiversity, 4(4): 131-140.
- Paranina, A.N. and R.V. Paranin, 2014. Interaction of the nature and ancient persons on the coast of the White Sea. Journal of Wetlands Biodiversity, 4(4): 131-140. [View at Google Scholar](#)
- Paranina, A.N. and R.V. Paranin, 2015. Navigation in geographical space as a factor of development of civilizations. Proceedings ICAE-2015 (Tbilisi-Batumi, 7-10 May, 2015). Tbilisi State University Press.
- Paranina, A.N. and R.V. Paranin, 2016a. Information as organized diversity. The 4 International Geography Symposium 23-26 May 2016. Kemer-Antalia-Turkey. Book of Proceedings. Ed. Recep Efe. pp: 730-740.
- Paranina, A.N. and R.V. Paranin, 2016b. Research methods of solar calendars by an example of Keret labyrinth, natural and cultural heritage of the White Sea: Prospects for conservation and development. Materials of III International Scientific-Practical Conference (Chupa, Republic of Karelia, Russia, July 15-17, 2016).
- Paranina, G.N., 2010. Light in the labyrinth: Time, space, information. St. Petersburg: Asterion Press. pp: 123.
- Rodoman, B.B., 1999. Territorial areas of the network. Essays on theoretical geography. Smolensk: Ecumene Press. pp: 256.
- Séchier, M., 2010. Les curiosités de notre patrimoine géologique première partie. Mémoire d'Obiou, 15: 47-54.
- Séchier, M., 2012. Les curiosités de notre patrimoine géologique (troisième partie) // Mémoire d'Obiou N°17: 43 - 50.

- Stafeev, S.K. and M.E. Tomilin, 2006. Five thousand years of optics: Prehistory. St. Petersburg: University of Technology Press. pp: 350.
- Streletsky, V.N., 2005. Geospatial cultural geography / human geography. Scientific and Cultural Educational Almanac, 2(2): 330-332.
- Sundial, 1985. Sundial and calendar system of the USSR. (Thematic Collection of Scientific Works) Series Problems of research of the universe. Leningrad: Main Astronomical Observatory of the Russian Academy of Sciences Press, 10: 227.
- Viktorov, A.S., 2006. Main problems of mathematical morphology of the landscape. Moscow: Nauka Press. pp: 252.

## BIBLIOGRAPHY

- [https://commons.wikimedia.org/wiki/File:La\\_Pierre\\_Perc%C3%A9\\_\(Dauphin%C3%A9\).jpg](https://commons.wikimedia.org/wiki/File:La_Pierre_Perc%C3%A9_(Dauphin%C3%A9).jpg)
- <http://incrediblethingworlds.blogspot.ru/2016/04/gate-of-sun-bolivia.html>.
- <http://primatologie.revues.org/docannexe/image/789/img-13-small480.png>.
- <http://montaiguille.free.fr/index.htm>

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