

Astronomical Tourism Sites in Armenia

Sona V. Farmanyan and Areg M. Mickaelian
NAS RA V. Ambartsumian Byurakan Astrophysical Observatory (BAO),
Byurakan 0213, Aragatzotn province, Armenia;
sona.farmanyan@mail.ru, aregmick@yahoo.com

Abstract. Armenia is rich in scientific and astronomical tourist sites, including astronomical archaeological sites, medieval universities, modern scientific institutions, and science related museums. Examples of archaeological sites, ancient observatories, and astronomical petroglyphs (rock art) are found in Armenia, as well as intangible items of astronomical heritage, such as Armenian calendars derived from ancient astronomical knowledge. Modern observatories and astronomical institutions can also be considered astronomical tourist sites as well. Armenia also has an astronomy and space science museum. Despite the fact that astronomical tourism is a new field, it has great popularity, and Armenia has great potential in this field. It is very important to introduce Armenia to the world from this perspective. In this paper we introduce the major astronomical tourism centers of Armenia.

1. Introduction: Scientific Tourism

Scientific Tourism is a new area not only in Armenia but also in the world. Scientific tourism involves visiting science-related centers. In order to be well organized, it is necessary that the scientific center has proper infrastructure to be able to present the center to public in an interesting way. Despite the fact that scientific tourism is a new field, it has great potential, and Armenia has great potential in this field. It is very important to present Armenia to the world from this perspective, including both scientific archaeological sites and modern institutions and museums.

Scientific tourism centers can be divided into 5 groups:

- scientific archaeological sites,
- medieval educational institutions (universities, etc.),
- nature sites,
- research institutions, and
- scientific or science-related museums.

Armenia has astronomy-related sites in four of these categories: archaeological sites, mediaval universities, modern research institutions, and museums. In this paper we give brief descriptions of the Armenian astronomical tourism centers, including those that are not yet active but may serve as sites for future scientific tourism.

There are many petroglyphs (rock art) spread throughout the territory of Armenia. Armenia is unique from this point of view. Ancient “observatories” like Metzamor and Zorats Karer are sites where astronomical observations were made are also among the astronomical heritage of Armenia. Armenia is also famous for its modern professional observatory, the Byurakan Astrophysical Observatory (BAO). Armenia is unique among dozens of countries to have its own space museum.

2. Astronomical Archaeological Sites

The most important astronomical archaeological sites in Armenia are the Metzamor historical-archaeological reserve museum, the Zorats Karer (Karahunge) ancient astronomical observatory, Ukhtasar, and the Voskehat rock art.

Zorats Karer (Karahunge)

The most fascinating historical astronomical building in Armenia is *Karahunge* (the “Armenian Stonehenge”) derived from *kar* for “stone,” and possibly meaning “singing stones” (it is also known as *Zorats Kar*). It is a megalithic assemblage 200 km from Yerevan and 3 km from town Sisian at an altitude of 1,770 m. The northern latitude is $39^{\circ}34'$, and the eastern longitude is $46^{\circ}01'$. It is an assemblage of many stones arranged in a circle with a few arms radiating from it. As with many other such buildings, Karahunge was thought to be a religious site. Only in the middle of 1980s was Karahunge first interpreted as an archaeoastronomical monument and studied by Prof. E. S. Parsamian (1999) and Prof. P. M. Herouni (1998). The age of Karahunge is estimated to be between 4000 and 7700 years.



Figure 1. The ancient observatory of Zorats Karer (Karahunge).

At the site there are 222 stones with a total extent exceeding 250 m, including 84 with holes of diameter 4–5 cm. Dozens of astronomical stone instruments with accuracy of 30 arcsec have been found. 40 stones form the central ellipse (45×36 m), with a ruined stone-cluster in the center. There is a 8 m wide 8-stone road to the northeast. Some stones were used to find the directions to definite stars. Observations of definite

stars suggest that the observatory was used between 7700–2200 BC, a period of about 5500 years. According to many researchers (e.g., Bochkarev & Bochkarev 2005), a comparison of the present state of the monument with its situation a hundred years ago reveals considerable degradation. Thus, the monument urgently needs protection. The monument is unique in the Trans-Caucasian region and could be the oldest known observatory in the world. If the estimated age of Karahunge is confirmed by archaeological methods, it clearly should be included in the UNESCO World Heritage list of the most important cultural memorials of our planet.

Metzamor Historical-Archaeological Reserve Museum

The ancient settlement of Metzamor is one of the unique monuments of world culture in which ancient copper and bronze complexes, sanctuaries, tombs, a possible observatory, etc. were excavated. It is located 35 km southwest of Yerevan in Armavir province, not far from Taronik village on the shores of the Metzamor River.

Metzamor is the site of one of the possible ancient observatories in Armenia. Metzamor was an ancient town. A settlement has existed there since the 5th millennium BC. It was first interpreted as an archaeoastronomical monument in the middle of the 1960s by Prof. E. S. Parsamian (1985). He found an observatory outside of the fortress with a probable age of 4600 years. As with Zorats Karer (Karahunge), Metzamor also needs more study and proper support and protection both from the Armenian government and the world archaeoastronomical community.

Rock art

Studies of the Armenian rock art present in the territory of modern Armenia (historic Armenia was ten times larger, having 300,000 square km area) show that the Armenians were interested in heavenly bodies and phenomena. The Earth, the Sun, the Moon, planets, comets, Milky Way, stars, and constellations are reflected in these pictures drawn on rocks in mountains around Lake Sevan and elsewhere in Armenia. These pictures and drawings are being studied by a number of historians, archaeologists, and astronomers. However, there is not enough governmental support to organize large-scale studies or at least try to catalog and preserve these ancient treasures.



Figure 2. Examples of the Armenian rock art.

2.1. Research Institutions

Among the modern institutions, those that are considered scientific tourist sites where equipment or laboratories present attractions include the NAS RA V. Ambartsumian Byurakan Astrophysical Observatory (BAO) and the Aragatz Cosmic Particles Station (operated by the Alikhanyan National Laboratory, Yerevan Physics Institute, YerPhI).

NAS RA V. Ambartsumian Byurakan Astrophysical Observatory

The BAO is one of the most important places in Armenia and attracts tens of thousands of visitors every year, both from Armenia and from abroad. It is no coincidence that for many years a visit to the Observatory is included as a mandatory program for Armenian schoolchildren, and an offer to visit the Observatory is almost always made by travel agencies.

The BAO was founded in 1946 and it is the only professional astronomical observatory in Armenia. It has a unique architectural collection of buildings and rich botanical garden. It is commonly used to represent Armenia to visitors. The BAO is situated in the Aragatzotn Province, on the southern slope of Mt. Aragatz, near the village of Byurakan.

Viktor Ambartsumian's house, where he lived for 46 years from 1950–1996, is now a museum located on the site of the Observatory. It was established in 1998 and introduces visitors to the life and activities of the great scientist.



Figure 3. The 2.6 m telescope of the Byurakan Astrophysical Observatory (BAO).

Visitors can see the largest (2.6 m) telescope and get an introduction to its operation, view the 1 m Schmidt telescope, and participate in observations with a dedicated small 32 cm telescope during the evening or hours. One of the most important accomplishments of the BAO is the famous and unique Markarian spectroscopic survey and its digitized version, which has been included in the UNESCO's "*Memory of the World*" International Register of documentary history. It is worth mentioning that it is one of 11 UNESCO heritage items from Armenia, very few of which are scientific in nature.

The Observatory has a conference hall where many international and local symposia, conferences, workshops, seminars, summer schools for young astronomers, and other events have been held. Viktor Ambartsumian's office is being used for smaller events, which has been preserved in its original state and is being used for Scientific Council meetings, solemn meetings, seminars, lectures, etc.

There is a hotel (Guest House) just inside the boundaries of the Observatory that can accommodate 25–30 guests, designed in the Armenian national architectural tradition by the famous architect Samvel Safaryan. The hotel has a kitchen and laundry. The Observatory also has a canteen, where the hotel guests can take meals; receptions, dinners, and other events may be organized there for up to 70 people.

Several types of visits to BAO are available, including astronomical lectures given by professional astronomers. Full information may be found on the BAO Scientific Tourism webpage.¹

2.2. Science Museums

Among museums having displays related to astronomy and space sciences are the Space Museum, the Matenadaran museum of ancient manuscripts (where many manuscripts of astronomical nature are preserved), and the Viktor Ambartsumian house museum in Byurakan (discussed above).

The Space Museum was founded by Grigor Gurzadyan in Garni in 2001, and in 2015 it was moved to Yerevan. The museum exhibits early samples of space research, including landing equipment returned from the Cosmos, other spacecraft, and a recreation of the ORION-2 Observatory, which was exhibited in Hannover EXPO 2000. The museum collection includes documents and manuscripts authored by cosmonauts, Vostok and Soyuz space engineers, scientists, and from NASA. One of the most valuable examples is a manuscript by Nobel Prize laureate Hans Bethe, written jointly with Grigor Gurzadyan.

¹<https://www.aras.am/SciTourism/eng>