Photographic Report

Localities:

Zavidovići, Mramorje, Beše, Grab

Last edited: December 25, 2013
A Special Thanks to:

Mr. Nedžad Branković who was my guide through Zavidovići area,

and

Mr. Doug Schurman who offered his precious contribution on:

'How to make an Atlas Stone'

(www.bodyresults.com)
Photo: The sun disc over Visočica hill (Bosnian pyramid of the sun)

(Credits Daniel Pach)
A Rolling Argument: Bosnian Stone Spheres

During the past few years mysterious stone spheres found in different locations in Bosnia and Herzegovina have aroused fascination and controversy. The scientific dispute between supporters and opponents of the project of the Bosnian valley of the pyramids often included the origin of the Bosnian stone spheres, if people in the distant past may have played a role in their artificial creation or if they were just a fabulous natural phenomena. However, according to the latest evidence, the whole issue related to the Bosnian stone spheres now appears much more complex and intriguing than previously thought, and will surely request a lot of scientific humility in order to unveil a mystery that has endured for thousands of years. Still today, the phenomenon of the stone spheres represents one of the greatest mysteries for archaeologists and other scientific researchers. First stone spheres were found in the early 1930's in the delta of the river Diquis in Costa Rica. Since then, hundreds of stone spheres were found in many locations around the world. Most of these mysterious spheres are composed of granodiorite, a hard intrusive igneous rock.

The Bosnian stone spheres phenomenon was actualized in 2004 when Dr. Semir Osmanagić and his team of independent researchers found a considerable number of stone spheres in different locations within the country. First stone spheres were found near Banja Luka. Going further, more locations with stone spheres have been discovered. In Teočak were found eight stone spheres made of granite, while in the settlement Ponikve, near town Vareš, was discovered an irregular shaped stone sphere that was probably formed by magmatic processes. Stone spheres weighing tons were also found in the village of Zlokuće, in Maglaj, and in the village of Jablanica, while a small stone sphere of unknown origin is kept in the library of the Franciscan Monastery in Kraljeva Sutjeska near Kakanj. A significant number of stone spheres was found in the settlement of Grab near town Zavidovići. On that location were found tens of stone spheres. The diameter of the spheres varies between 50 cm (19.7 in.) and 2 m (78.7 in.), while their exact origin or Mother Culture that could have produced them is still not known. Recent discoveries, however, made in Zavidovići municipality and near the town of Olovo provide first evidence of stone spheres having ceremonial functions, suggesting a possible connection with the pyramids situated in the Visoko valley. Latest research also suggests that people in the past used different types of rocks such as volcanic breccia conglomerate or non-clastic sedimentary rocks (e.g. limestone) to build spherical or rounded stone objects for ritual purposes such as votive stones (ex-voto) and/or Brotlaib's (stones in the form of a loaf of bread).
Photo: an almost perfect stone sphere found near the settlement of Grab, Zavidović. On its top, a small egg-shaped granite sphere that was found in the same place (see photo below).

Exploring the green forests in the area of Zavidović our two-man team came across two sites where stone spheres are found lying close to megalithic blocks and stećaks (standing tombstones). We found evidence of stone spheres that have been cut, shaped and polished, evidence of stone spheres carved out of rectangular sedimentary rocks, evidence of stone spheres having funerary functions, evidence of stone spheres decorated with rock art, and evidence of stone spheres used as votive objects (ex-voto; medicine stones).

These sacred sites are usually situated far away from main roads at the tops of hills or natural elevations. Stone objects of various geometric shapes which, among others include triangular shaped stones, have been found aligned in order to satisfy a specific geometric pattern of the sacred location.

New evidence also suggests that some of these stone spheres have been poured using molds/formworks. For the first time after decades, since the tremendous archaeological success story of Costa Rica’s mysterious stone spheres, new evidence delivers surprisingly more insight on the possible purpose and use of these unusual objects, as well about their symbolic and spiritual meaning. This time, the evidence comes directly from the heart of the Balkans, from Bosnia and Herzegovina.
“Do you see this fine thing? Do you admire the humanity of it? Because the human beings, my son, they believe everything is alive. Not only man and animals. But also water, earth, stone... but the white man, they believe everything is dead. Stone, earth, animals. If things keep trying to live, white man will rub them out. That is the difference.”

Old Skin Lodge

Since the dawn of time, the worship of sacred stones constituted one of the most general and ancient forms of religion. The characteristic feature of megalithic religions is that the ideas of immortality and of the continuity of life and death are expressed through stone. These stones were extremely diverse in form, ranging from rough blocks, over which the blood of the sacrifice, or the anointing-oil, was poured, to carefully wrought columns. In places where specially chosen stones took the place of natural landmarks, they expressed invitation to the deity to take up his abode in them. The Mayas venerated their mountains of stone. Before opening a quarry for the building of their pyramid temples, which they knew would wound the landscape, they would offer prayers:

“Oh Huitz-Hoh, the holy one, lord of the hills and the valleys, be patient with me... I about to cause you harm”.

1 Kerisel Jean (2005), Of Stones And Man: From the Pharaoh's to the Present Day, p. 3
Our ancestors were thinking of stones which they shaped or engraved to bear, as a friend, man’s first message of hope. From Theophrastus to Pliny, all ancient authors divided stones into male and female (e.g. the hardest granites were male, while the more malleable limestones were female). Pliny assures us that that stones possess a voice capable of responding a human being, “a voice that echoes the voice of man,” and that some stones were made to sing by the rays of the sun.\(^2\)

Certain ultra-hard stones, which the ancients used to call “magnetites” (which include granodiorite), are slightly magnetic, and hence have two poles, and it is believed that their poles were able to amplify the strength of the original magnetic current and by induction pass through the sarcophagus and revitalize a person lying in it.

Palaeomagnetic research around the world has shown that granodiorite is more strongly magnetized than the country rocks, accounting for a positive aeromagnetic anomaly. Experiments and analysis of magnetic rocks have also shown that granodiorite contains dominant magnetic minerals, while experiments in Physics have demonstrated that the magnetic field strength inside the spherical object is approximately three times that of the externally applied field.\(^3\) In other words, the magnetic field is amplified inside the sphere.

According to one legend, the phenomenon of magnetism was supposedly discovered and named after a Greek shepherd, named Magnes, whose iron staff became strongly attracted to a loadstone rock. Other legends claim that magnetism was first discovered in an ancient part of Europe known as Magnesia. The therapeutic power of magnets was known to physicians in ancient Greek, Egypt and China over 4,000 years ago, who used naturally magnetic rock (known as loadstone or magnetite) to threat a variety of physical and psychological ailments.

We find traces of of the use of magnet amongst the ancient Egyptians as well. Pliny relates that the temple of Arsinoe was to have been valuted with magnetic stone, in order to receive a hovering statue of Arsinoe made of iron. According to Cedrenus, an ancient image in the Serapium at Alexandria was suspended by magnetic force. Plutarch, related about a festival which were celebrated every nine years by the “Daphephorians” in honour of Horus and Apollo at Thebes, where an iron ball was carried about, from which several smaller ones were suspended.\(^4\)

\(^2\) Kerisel Jean (2005), *Of Stones And Man: From the Pharaoh’s to the Present Day*, p. 7
\(^3\) see prof. Richard Fitzpatrick ‘A soft iron sphere in a unigorm magnetic field’
\(^4\) Ennemoser Joseph (1854), *The History of Magic*, Volume 2, pp. 37, 38
Driving about 20 minutes uphill from the settlement of Grab where the greatest number of stone spheres has been found is situated the small village of Mramorje. Beside Mramorje, whose name comes from the word “mramor” (eng. marble), there have been discovered until now few other locations in Zavidovići municipality where stone spheres can be found standing together with other sacred stone objects. One is the natural elevation of Davulije, closely situated near Grab, and the other one is the locality known as Beše. The highest point in the village of Mramorje, consisting just few houses, a barn and a population countable by fingers, hosts the ruins of an ancient necropolis of unknown age. Today, only few stone objects can be found in the area. We were able to identify about twelve, they include: three stećaks (tombstones), five stone blocks without decoration, and four huge stone spheres. In the past the stone objects were much more, between twenty and thirty. According to testimonies of local villagers, in the past most of them were demolished or carried away due to various reasons. Unfortunately, it’s always the same old story with Bosnia’s ancient stone treasures. Like it happens quite often, their voices coming from a distant past remain neglected, unheard and misunderstood.

**Photo B**: stone block with rounded top; flat cut on the four sides.

Stone sphere no. 1, almost 1.6 meters wide (63 in.), has been cut in two halves (Photo C + D); and three other spheres approx. of the same size are found partially visible buried beneath the soil (Photos E+F+G).

**Photo C**: the first half of stone sphere no. 1

**Photo D**: the second half of stone sphere no. 1
Photo E: stone spheres no. 2, 3, and 4 are partially visible because buried beneath the soil; they are pointing to the Magnetic North.

The three stone spheres partially visible in the photograph are arranged on either side of a straight line that is pointing to Magnetic North. Moreover, the fact that these stone spheres are arranged in a line with tombstones and megalithic stones lead us to the logical conclusion that they must have had a specific religious-funerary function. However, as we will discover later, the use and purpose of Bosnian stone spheres was not limited to a funerary function within the religious and spiritual context.

Photo F: buried stone spheres (Ø 0.8 m/31.5 in.)  
Photo G: buried stone sphere; detail
Various stone objects are scattered over a large area of approx. 200 square meters following a precise geometric placement. Similarly to Costa Rican stone spheres, Bosnian stone spheres in the site of Mramorje are placed in groups and in straight lines together with Bosnian stećaks. (Photos H+I+J+K+L).

▲ Photo H: rectangular stone block; partially broken  ▲ Photo I: sunken stećak (tombstone); detail.

▲ Photo H: stećak; with with a pointed top  ▲ Photo I: stećak consumed by erosion; detail.

Stećaks, or stećci, is merely a convenient term to denote monolithic stones found in present days throughout Bosnia and Herzegovina and in parts of Croatia, Serbia and Montenegro. The name stećak comes from the present participle of the verb stajati, “to stand” – stojeći, and is most commonly used in reference works deriving from the assumption that they were exclusively designed during the mediaeval period to stand over graves as religious monuments (tombstones). Latest research, however, in the contexts of architecture, religious art, and ancient philosophical tradition has allowed to establish and expose a close relationship between millennia-old artefacts of the Old European continent, the stećak phenomenon, and the pyramids of Bosnia.\(^5\)

\(^5\) Nenad M. Djurdjević (2012), *The Ancestral Origin of Stećaks*
Hypothesis: the stone spheres in the site of Mramorje are signposts for the afterlife

How did a soul find his way to the afterlife? In many ancient cultures and religions man was regarded as a complex being that could exist both before and after death in different manifestations. Mythology in different cultures tells us the human souls past away go through a journey and obstacles before reaching the Dilum ("Place of Sunrise"); it is said to be a lush garden where souls live forever. For example, Aboriginals of Australia believed when a person dies the soul is ferried to Bralg in an enchanted boat that sails upstream where you are reunited with dead relatives and friends, while people of eastern Polynesia believed that Hawaiki ("Homeland") was reached after a long and dangerous journey.\(^6\)

The Aztecs believed the afterlife is found to the South of the Pole Star, while in Chinese Buddhism it is said the paradise to be to the West beyond the sunset. According to Zoroastrianism after a person dies the soul stays with the body for 3 days. On the forth day, angels of protection accompany it to the north. There are many such afterlifes to be found in religious beliefs of ancient folks with just a few differences. The stone spheres found on burial grounds in Costa Rica are sometimes theorized to represent the sun and served as a navigational aid to the souls passed away. Although in the site of Mramorje there is no direct evidence that links the four stone spheres to a specific sun cult, it is well known that in many ancient cultures (e.g. in ancient Egyptian religion) the sun or sun-disc/sphere symbolized immortality, and that one of the main missions of the Egyptian Sun God Ra was to bring light to the souls of the dead.\(^7\)

However, the analogies between Bosnian and Costa Rican stone spheres found on burial grounds show striking similarities. Our team was able to identify four large stone spheres aligned with other sacred stone objects, of which three stone spheres are aligned on either side that is pointing at Magnetic North. Thus, the logical conclusion seems to be that the stone spheres of the site of Mramorje may have had a religious-funerary function as navigational aids for the souls passed away, in other words, were considered signposts pointing to a place in the afterlife.

In conclusion, since the presence of a sacred mountain (or pyramid) in the surrounding landscape of Zavidovici has not yet been detected, the missing symbol may have been substituted by specifically shaping the top of some tombstones into triangular form (Photos I+H).

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\(^6\) Poignant R. (1967), Oceanic Mythology: the myths of Polynesia, Micronesia, Melanesia, and Australia

Beše: the magical stone treasury

**Fire Morgana:** differently than Fata Morgana, which is caused by abrupt variances in air temperature and can be observed in deserts, oceans or lakes, Fire Morgana is a mirage caused by variances between the physical and metaphysical planes. With some luck, a Fire Morgana can be usually observed in places of worship, ancient temples or close to pyramids.

▲ *Photo J:* view onto the central section of Beše site

“When I was a child, my father often told me about the story of an enigmatic fire that suddenly appeared late nights that was enshrouding the hill where the sanctuary stands. He told me how he and other villagers were getting out of their beds and running out of their homes in order to extinguish the fire in the forest… and he told me about the amazement of nearly everyone who reached the place… and murmured slowly and incredulously… there’s no fire.”

An old man from Beše

Unlike what is nowadays commonly believed, Bosnian sacred necropolises were not just mere burial grounds and, unlike the modern man’s worldview, for ancient humans stones were not inanimate objects, and the world was full of spirits. The sacred stone site in the locality of Beše represents a wonderful example against such widespread materialistic view of reality. The locality of Beše is distant about 4 km from the settlement of Grab (10 km from Mramorje). It is one of those enchanted places that lie hidden “somewhere” in the hilly forests of Bosnia, faraway from main roads and noisy crowds, where time seems to stand still or move incredibly slowly.
It was a big surprise and pleasure for me and my guide Nedžad to find a big variety of sacred stone objects together on the same location. The variety of sacred stone objects which have been used for ritual purposes at the site provide rare evidence on the rich spiritual life of people that once inhabited the area. Among tombstones, nicely or roughly shaped, there are stone spheres and Brotlaib stones (loaf of bread) that have been obtained from different raw materials.

The stone artifacts found in situ were built by using multiple construction methods. The collected evidence indicates that the place was not only used for burial purposes, but also a place that was used for healing through worship. The act of decorating a stone sphere with rock art (ex-voto) appears to have sprung directly from religious considerations and a cosmological belief system. Moreover, the characteristic religious stone symbolism found in Beše (and Mramorje) suggests that the site belongs more likely to a Neolithic culture rather than to the medieval period.

In the site of Beše we found:

- a tombstone made of limestone that end in a pyramidal top (Photo I);
- stone blocks made of limestone without pyramidal top (nicely and/or roughly shaped);
- a votive stone made of granodiorite with engraving (ex-voto; Photos K, L);
- a stone sphere carved out of non-clastic sedimentary rock (Photos M, N, O);
- stones in Brotlaib form made of volcanic breccia-conglomerate (Photo P, Q, R);
- a triangular stone made of limestone (Photo S).

▲ Photo I: example of stećak that ends in a triangular top
– Votive stone

▲ Photo K: votive stone; possibly the carving representing a human footprint.

▲ Photo L: votive carving; detail.
**Description:** the votive stone lying close to a huge rectangular stone block in the site of Beše represents most probably one of the earliest known objects used for ritual healing. An inspection of the artifact suggests that the stone was obtained by cutting a stone of spherical shape, most probably a stone sphere, on three sides. It was apparently marked with the impression of a human footprint (*ex-voto*). Several lines and incisions identified on its surface are still subject of study. Its width is approx. 50 cm (19.7 in.) The depth of the incisions vary between 0.5 and 1 cm (0.2-0.4 in.). The stone is made of hard granodiorite and engraving operations must have required a considerable period of time even with appropriate tools. This votive stone is of primary importance for the study of ancient healing rituals and magic. It most probably represents one of the earliest votive artifacts obtained from a spherical stone used for healing through worship and, therefore, can be classified as a rare example of votive stone sphere.
– Stone sphere carved out of non-clastic sedimentary rock

▲Photo M: broken/cut stone sphere; detail.

▲Photo N: opposite side; detail.
Description: The stonemason who has partially transformed the non-clastic sedimentary rock must have had a kind of inspiration similar to Michelangelo when he started sculpting his sphere. Because of the overall bad conditions of the spherical stone object we were not able to determine its specific purpose within the context of pagan religious worship. However, it may have been used as stone altar for religious offerings and/or have had a funerary function (see Mramorje).

A careful inspection of the object also suggested that its realization may have been interrupted at a certain stage of construction. In any case it represents the first objective proof that shaping spherical stone objects from non-magmatic stones (which definitely excludes the possibility of a natural origin) was a common practice among the inhabitants of the area somewhen in the distant past. Like in Mramorje, this stone sphere has been placed close to other sacred stone objects found at the site.
Brotlaib stones (loaf of bread)

▲ Photo P: stone in Brotlaib form (loaf of bread)

▲ Photo Q: side view; detail.
Description: an unusual and interesting discovery made in the site of Beše was that of two stones in Brotlaib form (loaf of bread). The raw material used to build the Brotlaib stones is volcanic breccia-conglomerate. Both stones have been shaped by man into the desired form. The biggest of two stones has a diameter of approx. 70 cm (27.6 in.). One has been cut in two halves for unknown reason.

Stones in Brotlaib form are rarely found in megalithic sites around Europe, but a considerable number of such type of stones can bee found in Austrian forests. A rare example of votive stone in Brotlaib form is kept in the church of Saint Peter in Salzburg, Austria (Photo left).

Credits www.mein.salzburg.com
Since the appearance of first agricultural communities wheat and bread are symbols of the fecundity of the earth and have had a profound affect on the religious beliefs. The actual date of the first wheat still remains a mystery. However, first grains of cereals were found in caverns of the Neolithic age dating back to 6,000 BCE and in tombs close to Dashur pyramid (3,000 BCE).\(^8\)

**Photo:** 4,000 years old triangular loaf of bread found under the foundation of Mentuhotep II's mortuary temple at Deir Al Bahari, Western Thebes.

In burial practice the wheat spike was often associated with the symbolism of resurrection. Examples survive on bas-reliefs from the temple of Isis, the Egyptian nature goddess and wife and sister of Osiris, in Philae, an island in the Nile, in which the mummy of Osiris god of the underworld presents spikes of wheat watered by a priest, symbolizing the new wheat that will soon grow. The same symbolism is found on clay statuettes of Osiris that contain wheat kernels, which were placed in graves to ensure the survival of the dead. Ancient Egyptians believed that an abundance of food such as bread will assure a stable universe.\(^9\) Also in Old Europe female sacredness and the female principle in general assumed greater importance because of women's influential role in agriculture. Therefore, the women's fertility was associated with that of the earth. Bread is not associated only with spirituality and the afterlife, however. Even in antiquity the production of bread was associated with procreation. The process of loading, baking, and unloading the oven parallels copulation, pregnancy, and childbirth.\(^10\)

The most logical conclusion that can be drawn from what we do know from the historical and archaeological evidence is that bread in the form of stone found in Beše may either have been considered a symbol of resurrection or fertility, in other words, they may have had a funerary function or that of ritual worship related to procreation and, least but not last, bread in the form of stone may also have played a role in medicinal belief.

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\(^8\) Eduard J.H. (1944), *Six Thousand Years of Bread: Its Holy and Unholy History* - New York: Doubleday, Doran

\(^9\) see Tour Egypt.net, *Bread in Ancient Egypt*

Description: The Brotlaib stone was unearthed by a local villager in the Ravne locality in Visoko, Bosnia, during the construction of a house, at a depth of approximately 2 m. The Brotlaib stone has a diameter of 50 centimeters (19.7 inches) and weighs approximately 30 kilograms (66 pounds). Independent researcher Nenad M. Djurdjević and Mr. Amir Suša were able to detect on the stone's surface several symbols with simple parallel lines V’s, X’s and two-dimensional triangles. These symbols belong to the Old European script (also known as Vinča) because of its association with the Vinča culture. The symbols found on the Brotlaib stone fall into the basic categories of symbols related to the moon, the rotation of seasons, fertility, and regeneration.
Triangular stones

▲ Photo Q: triangular stone made of limestone

▲ Photo S: triangular stone made of sandstone found in Ravne underground labyrinth

In Neolithic art the triangular stones stand at megalithic tomb entrances or they stay as backstones deep within a megalithic site (see M. Gimbutas Images of Goddesses and Gods). In many ancient cultures triangular stones were believed to represent the Divine (Spirit), or to encase the power of the four basic elements of nature (Fire, Air, Water and Earth). Triangular shaped stones were often used in megalithic sites for symbolic protection or to have continuity with a particular type of feature such as spirit portals. Oracles often used them in sacred sites in order to block uninvited “evil” spirits.
Pouring a Stone Sphere: Why Not?

Among many different stone spheres I was able to see and study in the area of Zavidovići there were few stone spheres that have particularly caught my attention. Stone spheres can be found not only in the settlement of Grab or sacred sites, but they can be also seen lying here and there along the roadside, in grassland and private gardens.

![Photo T: stone sphere found inside a privat property; with a round cavity on its surface](image)

The stone sphere has a diameter of approx. 50 cm (19.7 in.). It is characterized by a smooth surface typical for fine fine-grained concretes. The round homogeneous cavity that can be seen on its surface has an diameter of approx. 15 cm (5.9 in.) and, rather than being the result of carving processes, it seems to have been formed during the making of the sphere when it was a soft unstable mass. The most logical conclusion is that its actual form of the round cavity has been formed during one of the final stages of creation of the sphere itself, when the drying process created a depression due to water content reduction.

Moreover, in order that such process of the formation of both the sphere and cavity may contemporary occur, the presence of a mold becomes indispensable. Now, since it is highly improbable, not verifiable, or demonstrable that mother nature may have created all the necessary requisitions (e.g. during magmatic or glacial activities) to give place to such formation process, I will apply to my theory the principle know as Occam’s razor: “of several acceptable explanations (for a phenomenon), the most accurate and well-ordered theory of explanation is preferable, provided that it does not contradict the observed facts.”
More precisely, some of the stone spheres found in Zavidovići area are not the result of geological processes, nor have been carved, but rather are the result of an ancient engineering know-how for the construction of stones spheres using molds/formworks.

- **Building a Stone Sphere: From Theory to Practice**

There are many ways of making spherical stones, from actually shaping them out of granite (granodiorite), to pouring them using concrete-mix and molds/formworks, and the following pages deal with the latter method. The basic principle of making a stone sphere using concrete-mix involves the following steps:

1. Making the mold;
2. filling the mold with concrete mix;
3. chipping the mold and polishing the sphere to a smoother appearance.

In our experiment we will create a mold of Plaster of Paris around a rubber ball, remove the ball, fill the mold with cement, chip off the mold and put a few finishing touches on it. Of course, in ancient times man would have used other raw materials, some of which will be described hereafter. The construction and realization of a poured stone sphere (depending on its size) may require 7 to 10 days.

1. **Making the mold**

To create a mold we need to inflate the rubber ball to wanted diameter. Then we start mixing up the Plaster of Paris and once it gets to a sticky consistency we will start spreading it on the ball. We will make sure to leave a hole in the top of about 15 cm (approx. 6 in.) in diameter to pull the ball later out. We should be able to save the rubber ball future use by deflating it. Once the ball has been removed we will check inside the mold to make sure it's smooth and also to see if any parts of the mold look thin.
In ancient times instead of a rubber ball the builders may have used animal bladders. The bladders, intestines, and sometimes the stomach, were strong enough that, despite their thinness, they could be manipulated into amusing sizes and shapes.\(^\text{11}\) Although the animal bladder seems a plausible option, what seems more realistic is that with great craftsmanship it was possible to make the mold using clay in two hemispheres of same size carefully shaped, then the two halfs were connected together and the concrete-mix was poured through a hole appositely made. For the building of the mold may have been used clay, plaster or the right quality of ancient mud concrete.

![Photo: an example of mold made of clay](image)

Archaeological evidence tells us that clay and plaster were used in architecture by people in the ancient world dating back as far as 9,000 BCE. Evidence of it can be found in pyramids or temples.

2. **Pouring the mix**

Now that we have a good mold, you can mix the cement and begin filling the mold. In our experiment we used a wheel barrel to mix the concrete and it worked well. We were able to shovel the cement from the wheel barrel into the opening in the mold. Once it's full cover the top with a damp cloth. It should set about few days. In ancient times the use of geopolymer concrete would have fit the situation.

\(^{11}\) Carraher Ch. E. (2013), *Introduction to Polymer Chemistry, Third Edition 4.9.1 Balloons*, p. 156
3. Removing the mold

Once the cement has set you are ready to chip the mold away. In ancient times a wood chisel or stone hammer would have worked well. The slight round recession visible at the top came about from having a fairly good sized hole to pour the concrete into the mold/formwork. The hole is about 15 cm (6 in.) in diameter. It mainly seems to be a recession the same diameter of the hole as a result of the drying process of the concrete-mix created from the reduced water content. During the drying process it would be possible to keep adding mix and shaping the sphere so there would be minimal evidence of where the top was exposed. The finishing touches consists in polishing the sphere to a smoother appearance (Photo U). The polishing however, may cause the sphere to become less perfectly round, off by a centimeter here and there (Photo V).
The stone sphere in the photo above has a diameter of approx 50 cm (19.7 in.). The Plasticine-like surface at the bottom may be another indication of an artificial origin. One of the main difficulties encountered by geologists in the analysis of Bosnian stone spheres was that of reaching a general consensus and mutual understanding. Scenes of geologists animatedly discussing about the possible origins of the stone spheres occurred quiet frequently in Zavidovići municipality. It appears obvious that for many of them, who don't have a general background knowledge on ancient construction methods, or never have heard about Geopolymer Chemistry, Bosnian stone spheres still represent an unfathomable mystery.
CONCLUSIONS

The evidence collected at different localities in the municipality of Zavidovići suggests that stone spheres have played an important role in the spiritual life of ancient people that once inhabited the area. The stone spheres are often found in groups with other stone objects (i.e. tombstones) of different geometric shapes (see Mramorje and Beše). They are evidence of a close relationship that once existed between man and the stone and, on the cultural landscape, the stones with their physical settings were considered sacred.

As in other ancient cultures, hilltops and natural elevations were considered important locations, sacred locations. The stone spheres were intentionally transported to that locations and aligned with other sacred stone objects in order to satisfy a precise ritual geometry. The characteristic religious stone symbolism found in both sites suggests that they belong more likely to a Neolithic culture, rather than to the Middle Ages. The possible presence of other stone sanctuaries in the area where stone spheres are found should be considered highly probable.

1) From the geological and architectural viewpoint the stone spheres can be divided as follow:

- stone spheres built from granodiorite;
- stone spheres built from granite;
- stone spheres carved out of non-clastic sedimentary rocks;
- stones spheres using ancient geopolymer concrete and molds/formworks (to be confirmed by chemical analysis);

- Brotlaib stones (loaf of bread) made of volcanic breccia-conglomerate.

2) From the cultural and ritual viewpoint the stone spheres can be considered:

- stone spheres for funerary purposes related to the afterlife;
- stone spheres for healing purposes (i.e. ex-voto);
- stones in the form of bread (Brotlaib’s) which either can be considered a symbol of resurrection or fertility; and may have played a role in medicinal belief and magic.
Many of the stone spheres found in Zavidovići municipality look very similar, but a closer analysis reveals significant differences between some of them. They are made of different raw materials, and were constructed with different construction methods. However, after a careful examination I came to the preliminary conclusion that some of them were most probably cast in situ, rather than being the result of geological processes, or made of other stone types using traditional constructions methods like pecking, grinding and hammering.
▲ Photo: Nedžad Branković, Research Assistant

▲ Photo: Nenad M. Djurdjević, Independent Researcher