

KAABA STONE: NOT A METEORITE, PROBABLY AN AGATE

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The Black Stone of the Kaaba apparently is not a meteorite, although listed as a probable example in the Prior-Hey Catalogue of Meteorites. Diffusion banding and other physical attributes suggest that it is an agate.

The Black Stone of the Kaaba, or Kaaba Stone, is perhaps the most venerated rock in the entire world, but its petrologic nature remains unknown, unlike, for example, the Stone of Scone in Great Britain. It appears to be widely considered a meteorite by both laymen and scientists and is recorded as a probable example in Prior-Hey (1953) *Catalogue of Meteorites*. Although we have been unable to obtain the official view, in spite of much correspondence, it appears to be regarded by Moslems as "an object from heaven." Extraterrestrial space, in a scientific sense, is not the same as heaven in a religious context. It follows that a pre-seventh century religious relic from heaven is not necessarily a meteorite. Meteorites, as stones from extraterrestrial space, were only widely recognized as such after the L'Aigle fall in France at the beginning of the nineteenth century. The Kaaba Stone is regarded as a supernatural rather than a natural object, so Moslems themselves presumably are not inclined to accept the meteoritic interpretation.

The stone is emplaced in the northeast corner of the Kaaba, a cubic structure made of rock which occupies the center of the pilgrimage holyground in Mecca, Arabia (Fig. 1). It is mounted with a wide, oval, silver frame so that the face exposed to view is about 20 cm × 16 cm, or an area of 320 cm². The stone is reported to be cracked, broken, and repaired in the seven o'clock position. This broken nature was first reported in the West by Sir Richard Burton a century ago and persists today. The Kaaba Stone has suffered a bizarre history including being stolen and burned according to the rather detailed history offered by Kahn (1936). He regards the relic as probably an aerolite — i.e., a stony meteorite. He offers this simply as a best guess and points out that others have suggested that it is a basalt or closely related igneous rock.

Its fractured nature virtually rules out the possibility of the stone's being a nickel-iron meteorite, as these are tough and somewhat malleable rather than brittle. The stone is hummocky and "muscle," which attests to considerable hardness, probably Moh 7, as the caresses of literally millions of hands have not worn away the stone. Through rubbing, it has also developed an almost mirror-like polish which indicates that it is an aphanitic and



Fig. 1 The Kaaba Stone or Black Stone of the Kaaba mounted in a thick silver frame at the Kaaba in Mecca.

probably a mono-mineralic rock rather than a porphyritic rock (e.g., granite or gabbro) or one which is easily cleaved. A polish can be obtained on many stones through rubbing. For example, portions of the enstatite granophyre dikes at the Vredefort Ring astrobleme have developed a polish through cattle and wild game using them as scratching posts. But the polish is not nearly as bright as that displayed by the Kaaba Stone.

The color of the Kaaba Stone is black and perhaps even a jet black. This color may be the result of handling and not be the original color. If, however, black were the initial color, this would be consistent with many stony meteorites — for example, a common chondrite. But a chondrite would not withstand the constant rubbing to which the Kaaba Stone has been subjected, nor would it take a high polish. A howardite, in that it resembles a basalt, might conceivably have appropriate physical characteristics; but this is a rare type of meteorite, so that it is a most unlikely possibility. Also a howardite is not aphinitic and is rather light colored due to large plagioclase crystals.

Moslem legends state that the Kaaba Stone was one of the stars of Paradise and a “hyacinth” that turned black through the touch of an impious woman. As a color, hyacinth pertains to a bluish blue-red hue of medium saturation and brilliance. In modern gemology, a hyacinth is a reddish-brown variety of zircon or essonite garnet. To the ancients, to whom color and lustre were more important than mineralogical composition, a hyacinth apparently

was a precious stone of blue color — usually a sapphire, but probably extended to include amethyst. Of these two minerals, a sapphire does not occur in sufficiently large size and amethyst is too readily cleaved to qualify as the Kaaba Stone. In all probability, the hyacinth legend can be dismissed as mythopoetic.

If it is a natural, rather than a supernatural, object, a likely prospect is that it is a stone which is both somewhat unusual and intrinsically attractive, although not necessarily of a precious variety. This tends to rule out common basalt. Obsidian, on the other hand, might qualify — especially as this rock is jet black; but obsidian probably is too brittle and easily weathered to survive the handling accorded the Kaaba Stone. One type of mineral, however, does stand out as a distinct possibility. This is agate, especially a black agate; but again the coloration may be related to excessive handling and rubbing. Agate is mono-mineralic, hard (Moh 7), tough, and fine-grained (cryptocrystalline). Agate would also display a high polish through rubbing. (It would be useful to know if any small conchoidal fractures are present along the fractured sector of the Kaaba Stone, as this would further indicate agate.)

The probability that the Kaaba Stone is an agate is enhanced by the observations of a highly qualified, but, by his own choice, anonymous, Arab geologist who made the *Hajj* (pilgrimage to Mecca) and examined the stone carefully. According to this source, diffusion banding is clearly discernible within the Kaaba Stone, an observation which points rather clearly to its being an agate.

We thank the Barringer Crater Company for providing the second author with a grant-in-aid for research in meteoritics.

REFERENCES

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Manuscript received 2/5/74

NOTE ADDED IN PROOF

(Author's note: Since original submission of the paper, the following letter has been received by our colleague, Mohammed Kwalie at the University of Illinois. The original letter was sent to the Keeper of the Kaaba, who apparently, in turn, referred it to a Muslim scholar. Presumably we may regard the reply as official. A translation follows in which the diacritical marks on proper names have been omitted and in which those portions in parentheses are ours.)

الحجر الاسود هو حجر وضعه نبي الله الخليل ابراهيم عليه الصلاة والسلام في ركن الكعبة الشرقي وكان سيدنا محمد صلى الله عليه وسلم هو آخر نبي وضعه لما جدت قرش بناء الكعبة ، واختلفوا فيمن يضعه فاتفقوا على ان يحكموا اول راحل الى المسجد فكان اول راحل هو النبي صلى الله عليه وسلم فاخذه بيده الشريفة ووضعه في مكانه هذا .

The Black Stone is one which Abraham put in the east corner of the Kaaba. And the Prophet Muhammad placed it in position when the Quraysh (an early Arabian tribe in Mecca) rebuilt the Kaaba. At first they disagreed about who would set the stone in position, but then decided that the first person to enter the mosque would do this. The first to enter was the Prophet, and he put it in its place.

Its Nature

This stone is not one of the usual and known stones, rather it is one which the Angel Gabriel brought to Abraham when he built the Kaaba. He brought it from heaven. This is confirmed among us, the Muslim community. In our opinion, it is the correct information because our Prophet informed us of this, and it has been corroborated by various writers in such a way that it cannot be rejected.

(Editor's note: Rather than a verbatim translation which would read awkwardly in many places, an accurate interpretation is given below. Also, in the next two paragraphs of his letter, Mr. Muhammad Alwi gives a list of eighth and ninth century Muslim authors who confirm the truth of the origin of the Black Stone. They include such writers as al-Tirmidhi — died ca 892 A.D. — and al-Nasai — died ca 915 A.D. — authors of two of the six canonical collections of acts and sayings of the Prophet Muhammad. The word used by the authors and translated as “heaven” is not one which refers to “sky” but rather to “paradise.” The authors — all of whom call the Black Stone a gem (literally: sapphire) from heaven — do disagree on the time it came to earth. Mr. Alwi says that one states that it arrived with Adam; another relates that it had been on earth forty years when Abraham moved it from a mountain, Abu Qubays, to the Kaaba; and still another says that the Angel Gabriel brought it to Abraham at the time he was building the Kaaba.)

Its Form and Its Matter

The Black Stone is in the east corner of the Kaaba and is 1.5 meters above the ground. It is not possible to describe it now because the part of it which is seen in our time is comprised only of eight small pieces of varying size, the largest of which is the size of a date. These pieces fell from the stone at the time of attacks on it by the ignorant in early times.

Another writer, al-Kurdi, said in his history in 1294 A.H. (i.e., in the year 1294 Anno Hejirae) (to compute the Christian year, multiply the A.H. date by 0.970224, truncate to integer and add to 621.5774. Therefore, 1294 A.H. is 1875 A.D. — Editor) that there were 15 visible pieces 50 years earlier. At that time some of the pieces were hidden under the putty with which the stone had been repaired. Any pieces which had worked loose from it were attached to the top of the stone with wax, musk, and ambergris which had been kneaded together. This breaking off of pieces and the use of perfumes and the putty on it served to increase the blackness. As for the rest of the stone, all of it is inside the building

(the Kaaba itself) which has stone walls. These small pieces on top of the Black Stone are framed in a wide and thick circle of pure silver.

As for the measurements of the mass, one writer who saw it, delineated it saying he had studied it while it had been pulled out of the wall. The blackness is on the top only, the remainder being white. Its length is the one cubit. (In the Arab World a cubit is slightly over two feet — Editor.) That was written in 317 A.H. Another writer, Ibn Alaan, was among those who saw it during the remodeling of the Kaaba at the time of the Sultan Murad in 1040 A.H. He said that the Black Stone measures 1.5 x 1 x 0.33 yards with an inch or two being missing in various spots. He also mentioned a “bracelet” of silver.

The Color of the Black Stone

As for its color, it has been related in many religious and history books that this stone is white. In some stories it is described as “whiter than snow;” in another, “white as though it were silver;” and in another, “as white as yogurt.” The answer to why it was named the Black Stone is that the Prophet explained that the sins of man are what blackened it. Although many scholars have supported this explanation in their writings, there is no proof that this is the cause of the black color.

Some historians and religious scholars who went on the Hajj (pilgrimage) to Mecca said they saw traces of the whiteness. One saw a white dot visible to all; another saw three white spots, the largest being the size of a grain seed; a third said that the amount of white is decreasing. The historian Muhammad Ibn Nafi al-Khazai had seen the stone completely exposed during the rebuilding of the Kaaba and stated in his *History of the Kaaba* that the portion of the stone covered by the wall is white.

Special Characteristics of the Stone

This stone has great special characteristics which are confirmed by the Prophet Muhammad. Among them are:

1. that a Muslim may touch and kiss the Black Stone as explained in canonical works by al-Bukhari and Muslim;
2. that it is the holiest place in this great house of God, the Kaaba, which was built by Abraham;
3. that the Muslim begins the walking of the pilgrimage from the corner in which the Black Stone is located;
4. that whoever touches it makes a contract with God;
5. that it formerly had a great light but that God obliterated the light;
6. that, on the Day of Judgment, it will bear witness for those who surrendered to the truth and touched it;
7. that, on the Day of Judgment, it will be a mediator for those who have touched it;
8. that it has the status of the right hand of God on Earth.

Man needs something tangible so God put this stone on Earth and gave it these special characteristics so that the Muslim would have confirmation that he has made a contract with God. It is symbolic. Basic — true — wisdom is the examination of one’s own self to obtain the answers.

(We offer the following comments concerning this official communication. The Black Stone is regarded as an object from Heaven in the religious, but apparently not in the scientific or outer space sense. It is highly fragmented and was, at least originally, allegedly white. The petrology of the stone remains obscure. There is little to support, or deny, the authors' suggestion that the stone may be an agate. However, it has been so highly altered and the observable pieces so small that useful visual inspection may be impossible.

Perhaps favoring a meteoritic origin is the remark that the stone was *ejected* from Heaven and the version that it came from the mountain Abu Qubays. On the other hand, it is clearly regarded as a supernatural relic and not a natural one. In this case it would not be terrestrial rock or meteorite composed of minerals for minerals, by definition, are *naturally* occurring substances of fixed chemical composition. The official version, then, tends to deny a meteoritic origin. The letter contains no direct evidence for an association of the Kaaba Stone with a meteoritic find or fall. Whatever its nature, a meteoritic origin would seem unlikely.)