



ITS ORIGINS, FORMATION AND MYTHOLOGY

Hertfordshire Puddingstone is regarded by geologists as being one of the most unusual conglomerates in the world. Field surveys give estimations that no more than 150/200.000 tonnes exist and in terms of economic geology, this constitutes a rarity. No other conglomerate can match Hertfordshire Puddingstone for variegated coloured pebbles ranging from black, red, yellow, browns and more rarely white and the rarest of all, blue. It is in great demand by collectors, museums, universities and other interested parties throughout the world because of its beauty. From medieval times, mythical beliefs have grown up about this unique conglomerate, about which greater detail will be given later.

What is Hertfordshire Puddingstone and why the name of Hertfordshire? Until recently very little has been written about it, and what has been written, has been mainly educated guess-work. Early 19th century geologists gave to it the name of Hertfordshire, in the belief that it originated in the County, and the name of Puddingstone was first mentioned by medieval stone masons who referred to it as being "pudding".

#### FORMATION

Hertfordshire Puddingstone is of Palaeocene of Eocene age, i.e. 50 - 60 million years old. In this period pebble beds were formed when the sea receded from this part of the country. Examination of the sub-soils has revealed that some of these gravel beds remained above the level of the sea which returned in the succeeding Oligocene and Miocene periods. Soils with pteridophytes were established on these dry areas. Tests show that the soils contained an exceedingly heavy deposit of silica. It can be estimated that for each acre, to a depth of some three to four feet, the soil contained as much as 4,000 tonnes of silica. Over a period of 7 - 10,000 years, the pteridophytes and other plant life converted the silica into soluble opaline silica.

This realization led to investigations into the climatic conditions of the period, and from fossil evidence it was found that exceptionally wet and humid conditions prevailed for some thousands of years. This

not only encouraged vigorous growths of the pteridophyte forests, it also caused the soluble opaline silica to percolate through the soils faster than under normal conditions. From examinations of the matrix extracted from the conglomerates, it is evident that with the combined weights of the soils, vegetation and continuous water saturation, the deeper the penetration of the silica, the greater was the force exerted upon the detrital pebble beds to the extent that the underlying pebbles were crushed. Microscopic examination of this breccia showed that none of the particles had been weathered or water-smoothed and therefore the possibility that the breccia was mixed in with the original pebble beds was discounted. The opaline silica percolated with such pressure that it was able to force the pebbles apart and enable an almost perfect cementation to take place. This accounts for few pebbles being in physical contact with one other and gives the conglomerate its unique structure.

Further evidence to support this theory of the formation of the Hertfordshire Puddingstone, concerns the Greywethers, probably better known as 'Sarsens'. The physical structure and geochemistry of the Greywethers is identical to that of the matrix of the Puddingstones. When this period of exceptional silica percolation took place, and where no pebble beds existed below, the Greywether was formed.

#### CONSTITUTION

Further recent research into the minor mineral constituents in both the Puddingstone matrix and Greywether, reveal that they have a common factor in that the minor minerals of limonite, pyrite, marcasite, haematite, siderite etc are identical and by comparing the proportions in subsoils, it can be established with reasonable certainty, that Puddingstone and Greywether can be matched and it can be determined whether or not they were formed in the same area. Minor minerals in Puddingstone play an important part in the variegated beauty of the pebble. It is a question often asked, as to why there is such

Hertfordshire Puddingstone comprises original flint pebbles, and silicified pebbles which were originally other rock types such as chalk. Partially silicified pebbles are quite common. All the pebbles, and the matrix, can now be designated as CHERT: the original flint component will tend to have a microcrystalline structure and a conchoidal fracture whereas some of the other pebbles may have a fibrous structure and a jagged fracture. Conglomerates with black pebbles, known as Lydian cherts, are normally associated with the Reading Beds.

The variegated conglomerates consist of flint pebbles, which have various degrees of metal oxide staining. In rare instances they contain minute traces of metal silicates. The reds, browns and yellow pebbles were contaminated before becoming a part of the conglomerate, either from the sea water or by soils that covered them. The green and blue pebbles contain minute traces of chrysocolla and atacamite, these being oxidised metals. The quantity of these oxidised metals may be as little as 0.0002% in weight but is sufficient to give colour to the pebble.

The variegated pebble, often with a red centre, yellow middle ring and an outer brown/black ring is the result of two or more periods of secondary contamination. The red centre is more likely to be haematic staining and the middle colour the result of a mixture of oxides.

#### ORIGINS

During the recent field surveys and tests of selected districts in Hertfordshire and Buckinghamshire, it became more evident with the results of each test, that one could ascertain the locality of formation of the conglomerates. It is now known that the beds of pebble formed into a series of lenses and these eventually broke up into loose conglomeratic slabs. During recent excavations at Boxmoor, Hemel Hempstead, a large fragment of a lens, measuring some 10m x 6m x 1½m, was found. It was evident from its present location that it had

been derived from elsewhere and only glacial movement could have sited it in Boxmoor. Comparing samples taken from the specimen with those of samples taken from conglomerates found some 5km northwards in the Bulbourne valley, it was found that they matched in the proportion of minor minerals taken from the matrix. Further tests on conglomerates located some 5km southwards of Boxmoor, also corresponded with those found 5km north of Boxmoor. From these tests it was concluded the place of origin for conglomerates found in the region of the Bulbourne valley was Northchurch. Conglomerates located in the Gade valley are almost identical to those located in the Bulbourne valley, the only difference being a slight change in one minor mineral. This suggests that they were formed from different detrital pebble beds, but within close proximity of each other.

Lydian conglomerates present a different problem. Though they can be located in both the Bulbourne and Gade valleys, they have been transported from a greater distance. Though no extensive research has been carried out on the Lydian conglomerates, it is evident that the pebbles must have been where the Reading beds exist now. Reading beds exist in Buckinghamshire and a few outcrops are to be found in the St. Albans district and also Leverstock Green in Hemel Hempstead.

#### USES

Because of its composition, Hertfordshire Puddingstone has limited uses, too hard and bulky to be cut or broken for commercial uses but ideal for lapidary purposes. The first known use was by late Mesolithic man. This was the period of time when man had started crude farming methods, his principle crop being corn. To grind the corn he fashioned from a suitable size conglomerate, a quern. A quern is a hand-held corn grinding tool. Recently an unusual Puddingstone quern was found in the vicinity of a Mesolithic site at Boxmoor, Hemel Hempstead. This has been dated to 1,500 B.C. and is probably one of the earliest recorded Hertfordshire Puddingstone querns. It is now known that Puddingstone querns were fashioned right into the medieval period and possibly later.

The tool used to fashion these querns was flint, the same mineral as Puddingstone, both being of the same hardness, (7-7.5Mohs Scale). Iron was too soft for this purpose.

Puddingstone throughout the ages has been used as building material, mainly in the lower part of structures, and one may see to this day where drift and in situ Puddingstone have been incorporated as part of the building. Though legend has it that the Romans used Puddingstone conglomerates as distance markers, no evidence exists to support this, though some very old parish records do mention that they were used to mark out the parish boundaries and that they were also used to define property boundaries. It is also known that certain large conglomerates located in Essex have an association with early pilgrims, though for what purpose is not clear.

Many blacksmiths used large lumps of conglomerate on which to fashion their iron work. Around the late 18th early 19th century, small scale lapidary working commenced. A few rare examples of small table tops, kettles and iron stands can be seen in some museums. It must be remembered that no diamond-tipped saws were available in those days and it was no small achievement to work the hard Puddingstone.

#### LOCAL NAMES AND MYTHS

Hertfordshire Puddingstone has many local names, mostly attributed to myths that have existed from the medieval period. Even to this day, mythical beliefs exist. The following are some of the local names and traditions attached to them.

#### WOE STONES

This is the name given to those who live in the vicinity of the Bulbourne and Gade valleys. The name is little used these days but was common hundreds of years ago when these valleys were in constant flood. Earth that was washed away, would reveal new conglomerates exposed on the surface. These conglomerates were believed to foretell future disasters and hence the name of woe stones.

#### HAG STONES

Hag is one of the names given to a person believed to be a witch. One parish record dated 1662, reads "that a hag stone be placed on the coffin, for her bodie within be bewitched". Unfortunately, it does not record the nature of this person's death! Could she have been a victim of "trial by water"? Hertfordshire Puddingstone is still regarded as having the power to ward off evil and act as a good luck talisman. In various parts of the country, small blocks of conglomerate are to be found either inside the house or at the entrance of the doorway.

One farmer near Hemel Hempstead has a large conglomerate block in the cowshed. He will tell you that ever since his grandfather placed it there, they have never had a bad yearly milk yield! Many local stories about good luck have an association with Puddingstone.

#### BREEDINGSTONE

This is one of the better known local names given to Hertfordshire Puddingstone. A widespread belief exists that the conglomerate multiplies: that a male and female variety exists! The belief is so strong with some farmers, that one who was asked about them admitted that when he comes across a conglomerate, he will endeavour to smash it into smaller pieces to stop it from breeding. Another farmer will transport a conglomerate miles away from his property.

#### GROWING STONE

Growing stone has strong association with breedingstone, in that conglomerates grow in size. This is an understandable belief due to natural soil movement and general weathering; one example being when a conglomerate lying just below the surface gets exposed after exceptional heavy rainfall. Further rainfalls and general weathering gradually expose more and more of the conglomerate, giving rise to the idea that the conglomerate is growing in size. The farming community often experience the misfortune of broken plough shares

and tell you that the last time they ploughed the field the offending conglomerate had gone so it must have grown! Though the conglomerate does not increase its size, it does rise to the surface. In two districts of Hertfordshire, geological measuring instruments placed under the most stringent of conditions record that conglomerate blocks are rising to the surface at less than 1mm p.a. It can bring misfortune to some people. In recent years in South Buckinghamshire, an old house had to be evacuated due to severe foundation movement. The first indication of trouble was when the old stone kitchen floor started to rise! Excavations of the kitchen floor revealed a large conglomerate boulder, estimated to be not less than ten tonnes. It was far too large to be removed and over a period of many years, made the whole house unsafe. It is interesting to note that none of the local names given to Hertfordshire Puddingstone, is Rising stones!

#### MOTHER STONE

Mother stone is a name given in some parts of Buckinghamshire. The old belief is that it had magical properties and had the power to attract small conglomerate pieces to it. The other belief was that it was able to change flints etc., into Puddingstone!

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