Notes on the Brett Fountain
In the Upper Arboretum, Ipswich

Visited by Bob and Caroline Markham, 28.01.10
The portion inspected was the 'decayed' area c. 1-2 m above ground level.

Recent Refurbishment
Saved from serious decay, funded by Ipswich Society 1981.
Restored, (Ipswich Society Newsletter 161, October 2005)

The Rock
The 'stone' is Oolitic Limestone. It is composed of a mass of small rounded particles (ooliths), 'cemented' together by the mineral calcite (calcium carbonate) in the pore space between the grains. The ooliths are visible to the naked eye, a diameter of a millimetre being common. There are several classic British oolitic limestones of Jurassic age, including (about 170 million years old) Lincolnshire Limestones (Ketton, King's Cliffe, etc.) – pale whitish brown to yellowish brown with iron oxide and often including fossils shells.
They were formed as a lime-rich sediment in warm shallow seas, by the chemical precipitation of calcite around a small nucleus in agitated waters. Cementation and uplift converted them into limestone within land masses where they were then subject to slow stress and chemical changes as they responded to a new environment, as part of a geological cycle. Excavation of this rock and putting pieces of it in the Upper Arboretum will accelerate these processes as it responds to this new environment.
All materials 'decay', especially when exposed to weathering outdoors. Decay may be physical (mechanical) or chemical or both.

Physical Processes
Wind erosion, thermal expansion and contraction, and frost action can all work on stone.
Intergranular pore spaces, joint lines and holes allow rain water to permeate the stone to some degree. The stone is then liable to cracking by frost action and pieces may fall off because of the mechanical stress. Complete disintegration can even occur.
Laying stone with bedding tilting outwards may lessen permeation. Laying with bedding planes on edge may give different results.

Chemical Processes
In the presence of water, industrial and domestic pollutants may be converted into sulphuric acid and vehicular exhaust pollutants into nitric acid. Hence 'acid rain', which can fret limestone into various shapes, and can partially dissolve ooliths away to leave highly porous stone.
Movement of acidic water within the limestone may lead to the formation of gypsum (calcium sulphate) and associated volumetric expansion, which can jeopardise structures.
In cases of juxtaposition of two different types of stone there may be chemical reactions, e.g. with limestone above sandstone, alkaline moisture leaking out of the limestone may react with minerals within the sandstone.
Biological actions may have physical or chemical results.

Mortar, Metal and Coating

Unsuitable pointing mortar may accelerate decay around joint lines. Embedded iron fixings expand as they rust and may push stonework elements apart. Coating distemper may act like blotting paper, absorb rain and transmit it into stonework.

Stone Differences

Matching stone is often not straightforward. There may be subtle differences in colour, in texture – sedimentary structures, grain size (and changes in grain size), porosity and cementation, and in mineralogy (leading to incompatibility).

Similar stone obtained from different sources may differ in fine detail. Stone obtained at different times will start weathering in its new environment at different times. Should one use newly quarried stone or one that has been left outside for a period to confirm its desirability?

A check list for inspection visit

Texture

- Sedimentary structures
- Cross bedding
- Grains: size, size variation, partial solution
- Mineral cement
- Intergranular pores
- Fossils
- Colour

Blocks

- Tilted
- Bedding plane orientation: edge-bedded, face bedded

Cracking

- Joints

Spalling
Gypsum
Incompatible specimens
Biological activity
Pointing Mortar
Holes
Embedded material
Coating material
Orientation of faces
Height above ground
Open to rain/snow
Proximity to vehicles/industry

Inspection Report
28.01.10
The stonework at the level of the arches (i.e. about 1-2m above ground level) was inspected, especially on the north, west and east faces. There are two sets of blocks at this level, one (upper level) above the other (lower level). The lower level blocks have attached metalwork, the upper level blocks have the curve of the arch carved into them. (See illustration of north face.) Blocks show ooliths well, with some size variation, but generally less than 1mm diameter.
The lower level blocks are generally of a creamy yellow/buff colour and show easily seen ooliths, especially on broken surfaces. The upper level blocks are generally of a paler colour, ooliths have been partially dissolved out at the surface, there are contained fossil shells with some calcite infilling, some natural iron-staining may be seen in the west face, and a non-oolitic band on the north face.

Spalling mainly affects the sides of the lower level block on the north face and the northern side of the lower level block on the west face where the upper level block now projects above it; there is cracking parallel to the stone surface on the north and west faces, showing where pieces will fall from in future. Spalling has also affected the upper level blocks on the north and west faces where they rest on the affected lower level blocks.
There is some well developed vertical cracking at the northern side of the east face, which will lead to future falls.
Spalling has happened on the north-facing aspects of the fountain and will have been in response to the recent cold weather, having no doubt been plastered with snow, with ice forming inside the damp rock leading to mechanical failure. Similar spalling has happened this winter at other sites.
The upper level block on the north face contains a 2-3cm thick bed of non-oolitic material, with a slight tilt outward, and well seen across the curve of the arch (see illustration). This has weathered noticeably and has holes (?origin) in it.
There is some rust-staining at the metalwork, and also coating material at some places on the blocks; some mortar is loose.
The upper level blocks are c.10cm in 'horizontal' thickness (with mortar behind) suggesting that they are a relatively recent addition (they are also far less weathered, except for the 2-3cm band mentioned above). Could these upper level blocks be the 2005 restoration and the lower level an earlier period of work? (Are there any written records?)

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Comments for the Ipswich Society