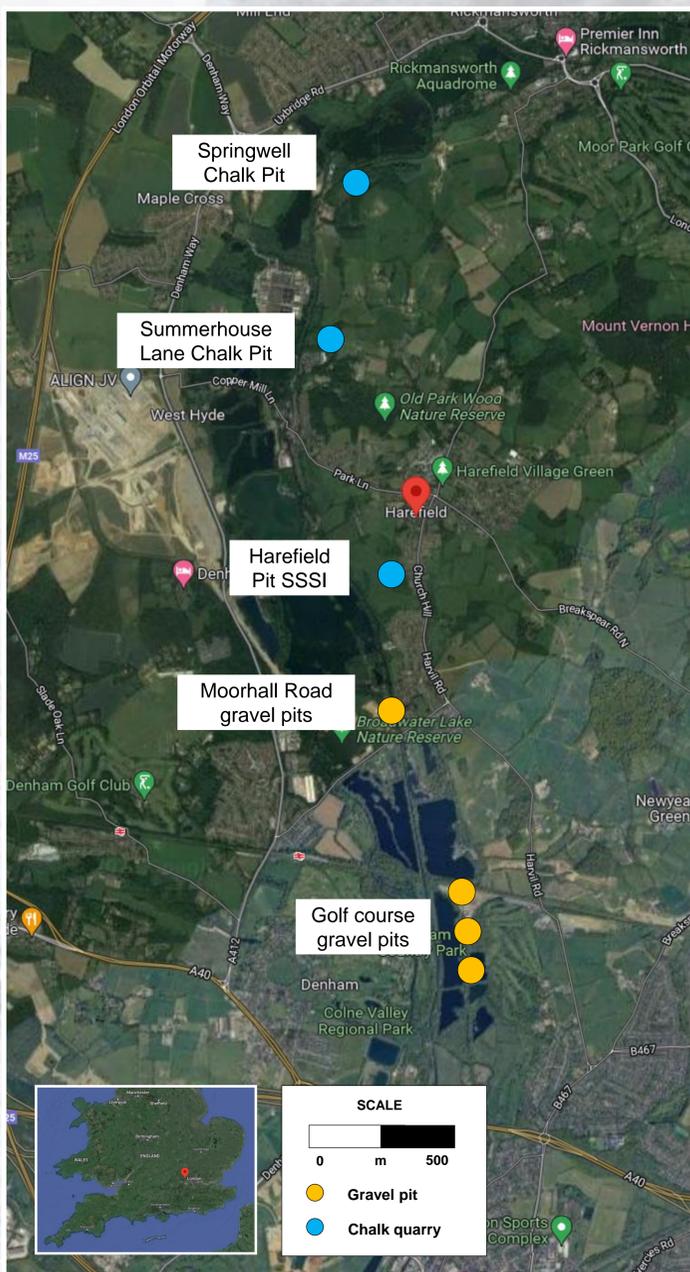


## INTRODUCTION

As a teenager growing up in West London in the 80's, I made more than 50 visits to the chalk quarries and gravel pits of Harefield. While relatively unfossiliferous, I was able to assemble a diverse collection of Upper Cretaceous invertebrates. The relative softness of the Chalk made excavating and preparing the fossils less challenging. The chalk quarries are now heavily overgrown and inaccessible, although it is still possible to collect from the gravel pits. Permission should always be granted before entering sites.



Map of the Harefield area (grey area shows Greater London)



Harefield Pit in 1913

## VICTORIAN RECORDS

Records dating back to at least 1894 record geological excursions to Harefield. These included visits in 1894 and 1899 to Summerhouse Lane Chalk Pit (identifiable by the solution pipes) and to Harefield Brick and Cement Works (Harefield Pit). The latter trip also took in the Springwell Chalk Pit. Another GA trip to Harefield took place in 1913.



## GEOLOGY OF THE UPPER CHALK

The Chalk was deposited on an undulating seafloor. Ridges separated basins of regional extent. Large scale mass movement such as slumps and slides were common. Much of the seabed was thixotropic for the first 10 to 20 cm (jelly-like) with progressively firmer sediment beneath. Much of the chalk was remobilized by bottom currents. The chalk itself is composed of the tests of billions of tiny coccoliths.

In outcrop the chalk is white and the flints are black. Periods of non deposition are characterized by lithified hardgrounds, with glauconitic and phosphatized intervals. The hardgrounds are heavily bored by sponges and sometimes by crustaceans and may pass laterally into nodular intervals. These layers typically host flints.

# Fossils of Harefield, Middlesex

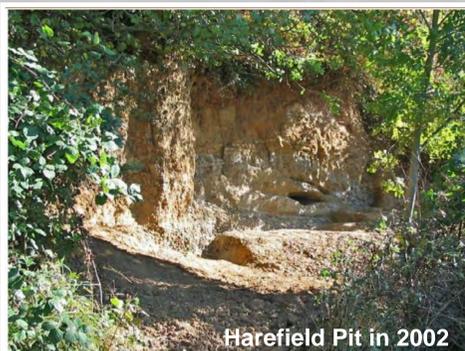
Jon Noad

Sedimental Services; University of Adelaide

Harrow and Hillingdon Geological Society Rock Show

February 2022

## 1. Overview; History; Geology



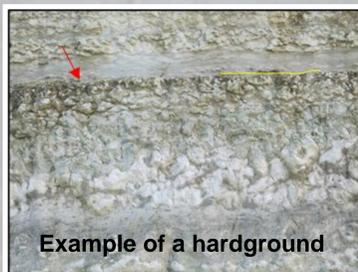
Harefield Pit in 2002



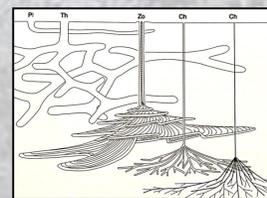
Flints pick out burrows

## ORIGIN OF FLINTS

Silica is produced by sponges as spicules, and eventually goes into concentrated suspension in sediment. It is later deposited from suspension/gel around shrimp burrows (*Thalassinoides*), nucleating on organic material. This is why flints may have a burrow-like appearance.

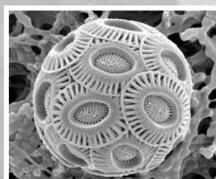


Example of a hardground



Chalk trace fossils

## Coccolith sphere



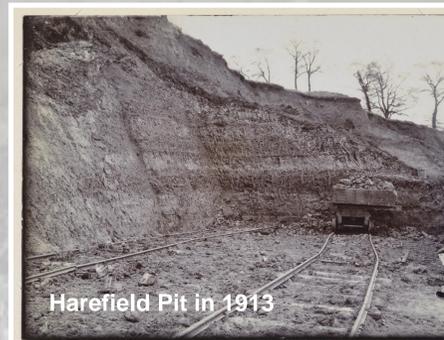
## SPRINGWELL CHALK PIT

The quarry formerly exposed a thick section through the Seaford Chalk, with numerous flint bands. Several solution holes were visible at the top of the quarry, which is overlain by Quaternary Taplow Terrace gravels. The quarry is very overgrown today.

Four episodes of **Dr. Who** included footage from the chalk quarry and **Blake's 7** used the quarry to stage a spaceship crash landing. I visited the quarry in the early 80s and saw a long scar on the quarry floor left by the film crew. Other series using the quarry included the **Avengers**; **Randall and Hopkirk (Deceased)** and the movie **Some Girls Do** (1969).

## HAREFIELD PIT, SSSI GLA34

Harefield Pit provides a key section in the London Basin for a sequence through the Upper Chalk, unconformably overlain by the Eocene Upnor Formation (resting on a burrowed Chalk surface), the Reading Formation (plant bearing), Harwich Formation and the sandy basal part of the London Clay, which contains shark teeth.



Harefield Pit in 1913

## Chalk Pit in 1913 with solution holes.

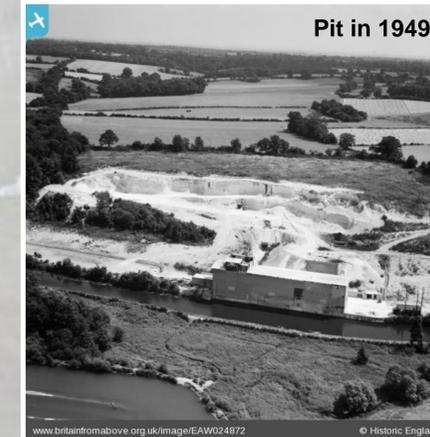


## Pit in 2005



## SUMMERHOUSE LANE CHALK PIT: SSSI GLA67

This quarry formerly exposed a thick section of Seaford Chalk with conspicuous semi-continuous nodular and tabular flint seams. Hardgrounds and thin marls are known from the lowest beds. Some flint nodules are large to very large. The quarry was marked by some stunning solution hollows that run from the top to reappear at the base. The face is still accessible but heavily overgrown.



Pit in 1949



Doctor Who



Doctor Who



Blake's 7

**FOSSIL PRESERVATION**

The fossils can be subdivided into two categories. Fossils collected from the two chalk quarries tend to be composed of original, calcite shell material. Those from the gravel pits occur as flints, usually internal casts of the animal in silica. The silica represents remobilized (glass) sponge spicules that tend to aggregate around organic material, forming flints. Many of the flints represent Cretaceous shrimp burrows termed as *Thalassinoides*. You can recognize them by their Y-shaped junctions.



Modern glass shrimp and burrow (Wikipedia)



Normal

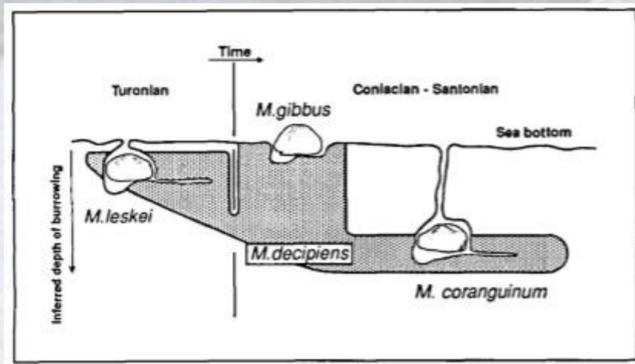


Gibbous

**MICRASTER**

Micraster is famous as a zonal fossil. It improved its burrowing capabilities through time, leading to changes in its morphology. This may have been in response to changes in predation – did plesiosaurs learn how to dig for echinoderms?

There are often two sympatric forms, a "normal" form and a "gibbous" form, with tallest point at centre of petals, sloping steeply towards the peristome. Gibbous specimens are fairly rare. These are thought to be two separate species, which commonly interbred.



**ALL THE FOSSILS ON THESE POSTERS WERE COLLECTED FROM HAREFIELD, MIDDLESEX**

**Fossils of Harefield, Middlesex**

**Jon Noad**

Sedimental Services; University of Adelaide

**2. Chalk palaeontology - echinoderms**



**ECHINOCORYS**

This is another common and important echinoderm from the Upper Cretaceous and is highly variable in both shape and size. It also occurs as a gibbous form.



An *Echinocorys* preserved as an internal cast in flint

Juvenile *Cidaris* preserved in flint



**CIDAROIDS**

This is the only type of regular sea urchin (with radial, five fold symmetry) that I have found at Harefield.



**CONULUS**

Another irregular urchin from Harefield.

**BOUGETICRINUS & ASTEROID**

Ossicles from the stem of a sessile crinoid (above) and poorly preserved starfish in flint (below) and arm fragment (to upper left).



Two drawers showing many of the best echinoids that I have collected from Harefield.



# Fossils of Harefield, Middlesex

Jon Noad

Sedimental Services; University of Adelaide

## 3. Chalk palaeontology – other invertebrates

ALL THE FOSSILS ON THESE POSTERS WERE COLLECTED FROM HAREFIELD, MIDDLESEX



Ventriculites



Sponge or bryozoan?



Porosphaera



Cliona



### SPONGES

Sponges are very common in the Upper Chalk, with a variety of species represented. Preservation may be in chalk or as flint casts.



Innoceramus



### BIVALVES

The most common bivalves are Innoceramids, which are thin shelled oysters that may be more than a metre in diameter. These presumably rested on the fluidized seabed like giant snowshoes. There are also scallops, other oysters and smaller pelecypods.



### WORM TUBES



Serpulid worm tube



Serpulid worm tube



Barnacle

### EPIFAUNA

Epifauna, animals growing on the tests of other animals, in particular echinoderms, include worms, oysters, barnacles and bryozoa. Their presence on the tests indicates that even animals living infaunally (within the sediment) must have been exposed at the seabed after death.



Atreta



Gibbythyris



Bryozoan



### BRACHIOPODS

Such fossils are relatively rare in the field.

Another possible fern-like bryozoan preserved in flint





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## Fossils of Harefield, Middlesex

**Jon Noad**

Sedimental Services; University of Adelaide

### 4. Palaeontology; Geology – Eocene



#### GEOLOGY

The top of the Chalk is bored into from above and the burrows filled by glauconitic sand. This is overlain by a layer of reworked, rolled, green coated, flint pebbles and then by thin, pebbly, white sands of the Upnor Formation. These are overlain in turn by the sandy Reading Beds becoming more clayey upward. The sand is cross-bedded and contains pale green plant remains. Both the fossils and glauconite indicate that much of the Eocene succession was deposited in shallow marine conditions, although there are some terrestrial clays in the Reading Beds.

#### GASTROPODS

Several species of gastropod have been discovered in Eocene sediments at Harefield. Like most of the molluscs, the shells are poorly preserved, but some species can still be identified. They include *Euspira* sp. and *Cochlespira* sp. most likely from the Harwich Formation (part of the Reading Beds; formerly termed the London Clay Basement Bed).

#### OTHER FOSSILS

Calcareous charophytes (stoneworts) have been reported from the Harwich Formation (only recorded occurrence). The burrows penetrating the underlying Upper Chalk are *Glyphichnus Harefieldensis*.

#### SHARK!

Shark teeth are rare at Harefield, but a few small teeth have been found. They are *Odontaspis* and *Striatolamia*, sand sharks that may have grown up to two metres in length. The fossils are usually found in the Harwich Formation.



Drawer showing many fossils collected from Harefield. Those from the Eocene are boxed in red. They include several species of ostracod, a tiny crustacean smaller than a rice grain..

#### REFERENCES

Available upon request – thank you to Diana Clements, the Geologists Association and others for all their work on these sedimentary rocks.

#### MY FAVOURITE FOSSIL (FROM HAREFIELD!)

This is a flint cast of an echinoid, *Micraster*. What makes it so special is that it is a geopetal structure. The hollow test was buried, and then silica-rich pore waters percolated through the pores. The dirt settled to the bottom, leaving the upper half of the internal cast preserved as pure crystalline silica i.e. glass. It is possible to shine a light right through the glass.

The pore waters may have entered through the anus, as the coarser material is piled up beneath it



Discovering a *Micraster* in Springwell Chalk Pit



#### BIVALVES

Several species of bivalve have been found in association with the gastropods. The large lamellibranchs (immediate right) are interpreted to be *Panopea* sp. while the abundant smaller bivalves are *Martesia saxorum*. Several other species of bivalves were found at the site including *Nucula* sp. .

