Bulletin of the Geological Society of Norfolk

No. 38a Reprint of Bulletins 1~10 (1953~1961)

Published December 1988

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CLIFF SECTIONS BETWEEN CAISTER AND SCRATBY

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INTRODUCTION

In the course of the storm which hit the Norfolk coast in February last much of the unprotected cliff betweeen Caister and Scratby was eroded, exposing sections which had not been studied, while in a fresh condition, for many years.

Thus briefly the points of interest of the section are :

1. The basal Brickearth series which may be compared with the Norwich Brickearth of the type sections. Is the shell content derived from the Weybourne Crag?

2. Problems concerning the contortion and disturbance of the lower beds, which involve the mixing of waterlain deposits by contortion.

3. It has provided material for a re-determination of the junction between the Great-Chalky and the Chalky-Jurassic Boulder-Clays.

4. The good exposure of the Corton Sands makes possible a detailed study of their fauna.

No formal abstract available for this paper.

Bull. geol. Soc. Norfolk (for 1953) **1**, 6. (Published September, 1953)

EASTON BAVENTS CLIFF SECTIONS - SOUTHWOLD SUFFOLK

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INTRODUCTION

The variably exposed cliff sections were examined from Southend Warren - north of Southwold - to Easton Bavents Broad. This examination showed that the threefold division, established by Whitaker in the G.S. Memoir 'The Geology of Southwold and the Suffolk Coast', is still apparent. A series of sands and gravels overlies a blue-grey clay above sands with shells and shell beds.

Throughout the references to the Chillesford beds it is apparent that some confusion arose as to their vertical limits and their origin. In a paper, which it is hoped, will be published in the 1954 Transactions of the Suffolk Naturalists Society, the detailed lithology of the sections is described and the stratigraphic problems are discussed and - in the light of recent work - some attempt is made to resolve the conflicting views previously expressed. It is suggested that a more appropriate nomenclature for the threefold sequence exposed at Easton Bavents is as follows:-

3. Pebbly Series - waterlain sands and gravels.
2. Chillesford Clay - largely an open water deposit.
1. Norwich Crag - shallow water shelly facies.

No formal abstract available for this paper.

RECENT WORK ON THE CONSTITUTION OF THE CHALK

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INTRODUCTION

At a recent meeting of the Geological Society of London Mr Maurice Black, M.A., F.G.S. delivered a lecture on the constitution o the Chalk.

The lecturer referred to earlier researches which showed that the Chalk of England and France was composed almost entirely of organic material, and to more recent work which suggested that much of the chalk matrix was precipitated chemically from sea water. This theory was based on a comparison with shoal water precipitated oozes of Florida and the Bahamas.

Detailed examination of the finer fractions of Chalk - made b Mr. Black, using an electron microscope - gave little support to the precipitation theory. Ordinary white Chalk was a mixture of coarse Molluscan debris and Foraminifera embedded in a finer matrix of coccoliths and their disintegration products. Mechanical analysis o Chalk revealed a complex size distribution of component particles an this distribution varied considerably from one horizon to another All analyses had certain peculiarities in common, and there were clearly defined limits to the way in which size distribution could vary. Within the normal grain size limits in typical soft chalks not coarser than 100 microns nor finer than one half micron - the properties of the main constituents could vary considerably to give chalk with different bulk properties. Dominance of **Inoceramus** *prisms or other shell debris, gave a slightly gritty texture but friable rock; chalks with abundant Foraminifers or spheres were apt to be hard or nodular. Preponderance of coccolith material gave the common soft chalks - as in the* **Micraster** *zones.*

No formal abstract available for this paper.

Bull. geol. Soc. Norfolk (for 1953) **1**, 8. (Published September 1953)

1) AN ABSTRACT OF INFORMATION OBTAINED FROM BORINGS IN NORWICH, 1951
2) THE YARE VALLEY BURIED CHANNEL

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INTRODUCTION

1) The local (Norwich stratigraphy between Grapes Hill and Bracondale, Trowse and Whitlingham Sewage Farm. The surface of the Chalk has an apparent dip of 1 in 720 E (60' O.D. to 30' O.D.), and normally varies less than 3' from a plane along the line of the borings :

(i) A macroscopic fauna occurred only east of the Yare in the bottom 10' (below 55' O.D.).
(ii) Sand, relatively free from clay and gravel, occurs only at levels between 10' and 20' above the base east of the Yare.
(iii) Clay bands which may or may not be yellow brown and micaceous, are found at all levels, but more frequently in the eastern half of the Whitlingham section, and not at all in association with gravels containing quartz pebbles of 2-4 cm diameter.
(iv) Rounded quartz pebbles (1-1.5 cm Ø) are present throughout the series west of the Yare, but only in the top 20' E. of it (usually above 55' O.D.).
(v) Larger rounded quartz pebbles (2-4 cm Ø) comprising up to 50% of the phenoclast component (less than 25% east of the Yare) occur at levels about 65'-70' O.D. The associated flints are subangular to subrounded whereas at lower levels are subrounded to rounded. Also a tendency exists for the interstitial sand to be replaced by a quartz grit in the higher levels.
(vi) The characteristic basement flints were not recognised west of the Yare.
(vii) Characteristically the series consists of a rounded to subrounded flint gravel (2-4 cm Ø) with interstitial sand.

2) A channel revealed in the Yare Valley at Trowse cut into Chalk to over 71.5' below O.D. and 250 yards across. The postulation of a channel is based on comparison with other East Anglian examples and slender evidence of Valley Boulder Clay at Cringleford and Thorpe.

No formal abstract available for this paper.

NOTES ON SOME EXPOSURES IN GLACIAL BEDS WEST OF NORWICH (1954)

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INTRODUCTION

1. Easton G.R. 63/148108 approx. Sandhill Quarries and Thorpe Gravel Co. Surface about 155' O.D.

About 15' of coarse gravel, rough horizontal bedding, lenses of sand or grit up to 5' thick filling shallow channels, often with a loamy base.

Boulder Clay (?) near road just below surface in Thorpe Gravel Co. Pit. Uppermost layers often with vertical flints or otherwise contorted (stratification).

2. Marlingford G.R. 63/121093 Surface about 150' O.D.

Flint Gravel in loam, lying in hollows in flint gravel in sand similar to that at Easton. Exposed to about 20'.

3. Hockering G.R. 63/088128 Surface about 150' O.D.

4. Honingham G.R. 63/093124 Surface probably just above 150' O.D.

5. Old Costessey G.R. 63/155120 approx. Norwich and District Gravel Co. Surface about 155' O.D.

Coarse gravel of 'Plateau' type, i.e. as at Easton, 15'-20' passing down via badly exposed intermediate beds into:-Extensively false-bedded and fine-bedded buff sands with chalk grains and smut, seen to 20' plus.

6. Costessey Brickyard at less than 100' O.D.

About 12' of pinky-brown clay containing flints and chalk, rough layers inclined at about 10' west. Overlain by white chalky band, sand, and sand and shingle.

No formal abstract available for this paper.

SURVEY OF THE RIVER TAS VALLEY
(PROGRESS REPORT)

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INTRODUCTION

A survey was made (1) to investigate the possible existence of river terraces, (2) to determine their geological history, and (3) to study the geological history of the river valley and the adjacent terrain.

Sections under investigation at : Caister, Stoke Holy Cross and Shotesham Mill.

No formal abstract available for this paper.

Bull. geol. Soc. Norfolk (for 1955) **3**, 1-4. (Published August, 1955)

THE AGE AND FAUNA OF THE *OSTREA LUNATA* CHALK AT MUNDESLEY, NORFOLK - EXPOSED 1898 AND 1954

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INTRODUCTION

A recent temporary exposure of chalk with **Ostrea lunata** *Nilss., on the foreshore at Mundesley, has given an opportunity to collect a wide varied micro- and macro-fauna which confirms the suggested Maastrichtian age of the beds (see Jeletsky, 1951). The chalk formed a low reef, just above the low-tide mark, about 25' long and 6' wide, running diagonally seawards 100 yds. south of the cliff-steps from the Kiln Camping Site at Mundesley.*

The exposed chalk was soft and grey, with scattered, often broken, black flint nodules. Crushed shell fragments, particularly of **0. lunata***, were very common, producing a gritty appearance. The generally crushed nature of the chalk suggests that it has been glacially disturbed and compressed.*

The following fauna was collected:- FORAMINIFERA - **Bolivina** *spp. (cf* **.incrassata***, "***qiqantea***". and* **decussens***), plus long-range and some arenaceous foraminifera. PORIFERA -* **Porosphaera globularis** *and others. POLYZOA -* **Castanopora magnifica**, **Membranipora** *spp.,* **Vincularia** *spp.,* **Onychocella** *spp.,* **Pyripora cruciata** *and cyclostomatous forms. CEPHALOPODA -* **Belemnella lanceolata**, **?Nautilus** *spp. LAMELLIBRANCHIATA -* **Ostrea lunata**, **0. vesicularis**, **Lima** *sp. ECHINODERMATA -* **Cardiaster ananchytis**, **Cyphosoma** *sp. ,* **Echinocorvs scutata**, **Cidaris** *sp.,* **Phymosoma** *sp.,* **Pentacrinus** *spp.,* **Bourqueticrinus** *sp.,* **Metopaster** *sp. and other asteroid plates. BRACHIOPODA* **Rhynchonella limbata**, **Magas pumilis**, **Carneithvris carnea**, **Terebratulina** *cf.* **gracilis***. (Serpulids, one unidentified coral and fragments of fish vertebrae also found).*

No formal abstract available for this paper.

Bull. geol. Soc. Norfolk (for 1955) **3**, 5. (Published August, 1955)

A STUDY OF THE CLIFF SECTION AT EASTON BAVENTS, NEAR SOUTHWOLD, SUFFOLK

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INTRODUCTION

The section described extends from Southend Warren to Northend Warren. The succession, from the bottom upwards, consists of Norwich Crag, Chillesford Clay, Pebbly Series and "Loam". Almost everywhere the topsoil has an associated iron-pan.

No formal abstract available for this paper.

THE EVOLUTION OF THE SOUTHERN NORTH SEA BASIN

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INTRODUCTION

The STRUCTURAL LIMITS OF THE BASIN ***generally*** *are set: (i) on the south by (a) the East Anglian-Brabant massif (upstanding from Upper Carboniferous to Lower Cretaceous), (b) the Weald-Artois axis (instituted Eocene, mainly Oligocene to Miocene); (ii) on the east by (a) the Erklenz [a_3] axis (uplifted Trias), (b) the Rhine shield (with Tertiary graben); and (iii) on the west by the Pennine [a_5] axis (uplifted Trias).*

The inclinations of the Tertiary unconformities developed in the Ipswich, Woodbridge and Felixstowe areas (Boswell, 1927; 1928) indicate progressive tilting of the Chalk formation to the east.

The NW-SE AXIS CONCEPT propounded ***locally*** *by Boswell, (1915) must be modified. (i) Contours constructed for the surface of the Palaeozoic floor (Bullard et al., 1946) suggest, if anything, a NE-SW trend. (ii) Data from Woodland, (1946, Figs. 9, 10) suggest the 'axis' is better regarded as the point of intersection of the N-S (Gt. Yarmouth) and the ENE-WSW (London Basin) downwarps of Tertiary deposition. (iii) Further data from Woodland, (1946, Figs. 7, 8) show a deep trough (-150' O.D.) of Pleistocene deposition running NE-SW, at right-angles to the proposed 'axis'.*

The MAIN STAGES IN THE ORIGIN OF THE BASIN were: (i) the formation of the Paris and NW German Basins and the setting-off of the North Sea Basin within the East Anglian-Brabant massif and the Erkelenz axis in the immediate pre-Jurassic; (ii) the foundering of the southern margin (East Anglian-Brabant massif) during the Lower Cretaceous; (iii) the re-establishment of the southern margin (Weald-Artois axis) and production of present limits during the Tertiary.

No formal abstract available for this paper. (Presidential address, 1955)

Bull. geol. Soc. Norfolk (for 1956) **5**, 1-5. (Published May, 1956)

THE GLACIATIONS AND INTERGLACIALS OF EAST ANGLIA; A SUMMARY AND DISCUSSION OF RECENT RESEARCH

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 # SUMMARY

Recent work on the Till fabrics and the orientation of erratic has confirmed this succession and equates the period of deposition c the Gipping Till with that of the Main Chalky Boulder-Clay of the Midlands (recently described by Shotton). In East Anglia there were three main ice advances (Hunstanton Till not considered here). New work on the interglacial deposits between the Till sheets, using largely pollen analysis techniques and a reconsideration of the typology of the Palaeolithic implements, has resulted in the following broad correlation:

Correlations with N. German Glaciations and Interglacials. (Woldstedt - 1954)	*Deposits in E. Anglia*	*General Names of Glaciations and Interglacials in E. Anglia.*
	(Solifluxion Deposits)	
Emmian Interglacial	*Cambridge and Ipswich Interglacial Deposits*	*Ipswichian Interglacial*
Saale Glaciation	*Gipping Till*	*Gipping Glaciation*
Holstein Interglacial	*Hoxne and Clacton*	*Hoxnian Interglacial*
Elster Glaciation	*Glacial Deposits Lowestoft Till, Corton Beds and Cromer Beds*	*Lowestoft Glaciation*
Cromer Interglacial	*Cromer Forest Bed*	*Cromerian Interglacial*

No formal abstract or introduction available for this paper. (Summary by A.J. Martin)

THE NORWICH CHALK *BELEMNITIDAE*

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SUMMARY

GENERA: *The Belemnites of the Norwich Chalk belong to the genus* **Belemnitella.**
SPECIES: *D. Sharpe, (1853), following Schlotheim, distinguished two species of* **Belemnitella** *from the Upper Chalk:* **B. mucronata** *and* **B. lanceolata***.*

Sharpe's description and attribution of mucronata specimens (with strongly marked vascular impressions and sub-central alveoli) to **B. mucronata** *was correct. His description of non-mucronate specimens (with weak or absent vascular impressions and central alveoli) does not coincide with Schlotheim's* **B. lanceolata** *and their attribution to that species was incorrect.*

(i) *Many specimens from the* **Actinocamax quadrata** *zone of the Upper Chalk, subsequently determined as* **Belemnitella lanceolata***, on the basis of Sharpe's erroneous description, can in fact be referred to* **B. pracecursor** *Stolley, 1897, see Jeletzky, 1948.*

(ii) *However, specimens from the zone of* **Belemnitella mucronata** *of the Upper Chalk, determined, on the same basis, as* **B. lanceolata***, are almost certainly distinct from* **B. pracecursor** *and* **B. mucronata***, and must, for the present, be designated* **Belemnitella** *sp. (Wright, C.W. and E.V., 1950).*

(iii) *Schlotheim's original* **B. lanceolata** *is now referred to the genus* **Belemnitella***; it is not found lower than the of the Trimmingham Chalk horizon, where it is abundant.*

VARIETIES: **B. mucronata** *has been assigned two varieties* **B. mucronata** *var* **senior** *Nowak, 1913, found in the lower portion of the zone of* **B. mucronata, and B. mucronata** *var* **minor** *Jeletzky, 1951, which is found in the upper part of the zone of* **B. mucronata** .

No formal abstract or introduction available for this paper.

Bull. geol. Soc. Norfolk (for 1957) **6**, 2-4. (Published February, 1957)

THE DIFFERENTIATION AND CORRELATION OF EAST ANGLIAN PLEISTOCENE DEPOSITS : A REVIEW OF RECENT RESEARCH

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ABSTRACT

Deposits of different ages are differentiated on the basis of the arrival and extinction of molluscan species. Thus the CORTONIAN is distinguished by the following arrivals - **Cardium tuberculatum**, **C. exiguum**, **Venus verrucosa**, **V. gallina**, **Gibbula magus**, **Nassa reticulata***:* **Turritella communis** *becomes common (***Tapes decussatus** *is omitted as Reid, (1890) records it from the Weybourne Crag). The Cortonian includes the last occurrence of the following extinct species -* **Nucula cobboldiae**, **Purpura incrassata** *and* **Nassa reticosa**. *The MARCH GRAVELS are distinguished by the following arrivals -* **Skenea planorbis Tellina tenuis**, *and include the last occurrence of the extinct species* **Tellina obliqua** *(one valve only).*

Deposits of the same age are correlated by (a) the common arrival and extinction of molluscan species, and (b) the matching of alternating 'cold' and 'warm' faunas. Thus many species become extinct at the end of the CORALLINE CRAG-ASTIAN, and many arrive in common in the RED CRAG-CALABRIAN. **Nassa reticulata** *arrives and* **Turritella communis** *becomes common in the CORTONIAN TYRRHENIAN. Discrepancies are explained by southward migration (late arrivals in the Calabrian from the Coralline Crag), and northward migration (late arrivals in the Cortonian, March Gravels and Holocene from the Astian and Calabrian). Discrepancies in climatic correlations are explained as the result of steeper temperature gradients caused by variations in the Gulf Stream, Drift.*

(Presidential address, 1956)

Bull. geol. Soc. Norfolk (for 1957) **7**, 1-3. (Published December, 1957)

THE CRETACEOUS SETTING OF EAST ANGLIA

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INTRODUCTION

Throughout the Cretaceous period East Anglia formed a positive area of stability. To the north and south were regions which were submerged by the sea earlier, sank more rapidly, and to some extent were more strongly affected by contemporary earth movements. The stability of East Anglia is reflected in the facies of the rocks in the area. Sometimes the East Anglian region shows differences from both the regions to the north and to the south, and at other times it acted as a faunal barrier. Most commonly it was the position of an east-west line of demarcation between a northern and a southern facies.

Such a stable area as a demarcation line between facies is familiar in Jurassic sedimentation under the name 'axis'. During the Cretaceous these axes were much less common, and this one in Norfolk, which I propose to call the Icenian Axis, is much the most prominent in north-west Europe. In the British Isles the submarine sandbank along the Beer axis, described by Smith, (1957), is on a minute scale by comparison, for both the Beer axis and the neighbouring Branscombe and Charlton axes only affect the lithologies very locally. The Branscombe axis does however act as a faunal barrier, particularly to echinoderms (Spencer, 1913). Outside Britain another Cretaceous example is the Merlerault axis in Perche (Dangeard, 1943).

HUTTON, SMITH AND LYELL IN NORFOLK

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INTRODUCTION

James Hutton, William Smith and Sir Charles Lyell all visited or stayed in Norfolk during their lifetimes and their connections with the county are of some interest. The reasons for their visits differ, and, of the three, Smith spent the longest time in the county. Their visits in no way coincided and more than a century elapsed between Hutton's arrival in Norfolk in 1752 and Lyell's last recorded visit in 1869.

Hutton, in 1752 at the age of twenty-six, having graduated from Edinburgh and Leiden, set about improving the family farm in Berwickshire. He heard that the best farming practice of the time was to be found in Norfolk and he stayed in the county for nearly three years from 1752 to 1754. He went first to Yarmouth and later moved to Norwich, where, under the guidance of John Dibol he "enjoyed the company of the most intelligent farmers". Among other things he was impressed by the high standards of ploughing in the county and on his return to Berwickshire took with him both a Norfolk plough and ploughman.

Smith came to Norfolk as an engineer with the job of draining and improving the marshland north of Yarmouth and improving the sea defences. He visited the county for long periods between 1801 and 1809 and lived in Norwich from 1805 to 1807, during which time he examined many local exposures.

Lyell, like Hutton, first visited Norfolk when his interest in geology was just developing. In 1817 he stayed with Dawson Turner in Yarmouth and a number of Lyell's letters written from Yarmouth show that he had speculated on the relatively recent changes in the Yare Estuary. He visited Norfolk frequently, knew many local naturalists and made many observations on Norfolk geology.

No formal abstract available for this paper. (Presidential address, 1957)

Bull. geol. Soc. Norfolk (for 1958) **8**, 1-2. (Published March, 1958)

CRETACEOUS FLINT

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INTRODUCTION

Geologists have always been concerned with the problem of the origin and formation of flint. Early workers on the Chalk were particularly puzzled by the fact that flint, almost pure silica, should be found so abundantly in an almost purely calcareous sediment. Many early theories on the origin of flint were based on the idea that the Chalk was a deep sea deposit accumulated in a fashion similar to the present day Globigerina oozes. However, it is now thought that the Chalk was deposited in water less than 300' deep.

At a very early date the term "flint" was applied to, and generally restricted to, siliceous rocks in the Chalk. The modern view is that the terms "chert" and "flint" are synonymous. Pettijohn, (1957), writes "while the term flint antedates the term chert, useage favours the latter as the proper designation of the materials to which both terms have been applied". However, the term flint is so firmly established in British literature on the Cretaceous that it would be difficult and confusing to replace it with the word chert.

No formal abstract available for this paper. (Presidential address, 1958)

PATTERNED GROUND - A DESCRIPTIVE REVIEW WITH EMPHASIS ON THE IMPORTANCE OF PERMAFROST FEATURES IN EAST ANGLIA

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INTRODUCTION

During the last four summer field seasons, while carrying out geological work on part of the Caledonian Basal Gneiss and Schist Complex of N. Southern Norway, I have had opportunity to study the active permafrost fields which occur generally above the 6,000 foot contour on the Hestbrepiggan Range of the Jotunheim Mountains, southern Norway (E.8°20, N.61°50). These freshly developed examples of patterned ground have stimulated an interest in the features possibly formed by frost action in the superficial deposits of East Anglia.

Accordingly, I have conducted a survey, both of the literature, and, in a rather limited way, of the evidence as presented in the field. A review of this work is presented here.

The terms "patterned ground" and "permafrost features" are not completely synonymous. Whereas permafrost "is perennially frozen mantle or bedrock" which occurs "wherever a temperature below 0°C remains for several years" (Black, 1954), patterned ground, in its broadest sense, is "a group term for the more or less symmetrical forms such as circles, polygons, nets, steps and stripes that are characteristic of, but not necessarily confined to, mantle subject to intense frost action" (Washburn, 1956).

In fact, patterned ground is a well known surface phenomenon in localities such as the arid parts of Africa and Australia, which are well outside present or recently past permafrost zones. However, in view of our situation in a recently glaciated area, particular interest in East Anglia is centred on features that have resulted directly from permafrost activity, as has most patterned ground throughout the world.

After brief descriptions of the various structural types covered by the general term patterned ground, it is intended to review the detailed origins of these features. Finally, attention will be drawn to the importance of past permafrost activity in East Anglia.

No formal abstract available for this paper. (Presidential address, 1960)

Bull. geol. Soc. Norfolk (for 1960~1961) **10**, 1-15. (Published March, 1961)