Bulletin of the Geological Society of Norfolk

No. 39a Reprint of Bulletins 11~18 (1962~1969)

Published November 1990

CONTENTS 1 of 3

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ISSN0143-9286

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ISSN0143-9286

GLACIAL TECTONICS - A REVIEW AND DISCUSSION OF THE APPLICATION OF TECTONIC CONCEPTS TO THE STRUCTURES OBSERVABLE IN GLACIAL DEPOSITS

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INTRODUCTION

In my last address to the Club I dealt mainly with the results of static (except on a small scale) permafrost conditions such as much have obtained over the most of the British Isles during at least one Pleistocene glacial phase. Evidence was presented from East Anglia and elsewhere, and it was noted that a direct comparison could be made between types of fossilised patterned ground in this country and active permafrost features of the Jotunheim mountains of Norway, in particular.

This year I intend to follow a line of research suggested by last year's concluding section: tectonic activity in present and past glaciated areas, with special reference to Norfolk. I am not concerned with attributing to virtually every glacial feature a tectonic origin of some sort. Rather, I am concerned that where tectonic features do occur in glaciated areas they should be recognised as such. What follows sets out to show what can be done with tectonic evidence once careful observations have been made and the limitations of the techniques understood.

No formal abstract available for this paper. (Presidential address, 1961)
Bull. geol. Soc. Norfolk (for 1962) **11**, 1-17. (Published December 1962)

GLACIOFLUVIAL DEPOSITS AT BURGH CASTLE, SUFFOLK

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Edited by C.E. Ransom [#]

[#] The Nature Conservancy,

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INTRODUCTION

The susceptibility of flooding of the coastal region of Norfolk and Suffolk has necessitated the building of new sea defences and, in connection with this, some gravel pits have been reopened. These notes describe such a reopened pit at Burgh Castle (TG 4818 0428).

Succession

6.	*Loamy sand with pebbles at base.*	*3 to 6 feet.*
5.	*Chalky Boulder Clay (Lowestoft Till?).*	*2 to 12 feet.*
4.	*Corton Sands.*	*0 to 20 feet.*
3.	*Pebble Bed.*	*2 to 10 feet.*
2.	*Well bedded coarse sand.*	*0 to 5 feet.*
1.	*Laminated sands and clays.*	

No formal abstract available for this paper. (Edited by C.E. Ransom)

Bull. geol. Soc. Norfolk (for 1963) **12**, 1-4 (Published February 1965)

THE CROMER FOREST BED SERIES

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INTRODUCTION

The Cromer Forest Bed Series was studied by several workers in the nineteenth century (S. Woodward, 1833; Lyell, 1833; Trimmer, 1845; Prestwich, 1871; Reid, 1882, 1890). The first attempt to establish a complete sequence was that of Reid in the Geological Survey Memoir of 1882: (the beds above and below the Cromer Forest Bed Series are shown):-

Till.
Arctic Freshwater Bed.
Leda myalis *Bed.*

	{Upper Freshwater Bed.
Cromer Forest Bed Series.	*{Cromer Forest Bed* **or** *Estuarine Bed.*
	{Lower Freshwater Bed.

Weybourne Crag.
Chalk.

This composite sequence was constructed from the many exposures of the Series found on the East Anglian Coast, and at no place did Reid find a complete succession. Reid suggested that the beds were deposited at or near the mouth of a large river, probably a forerunner of the Rhine. He also pointed out that the Weybourne Crag and the Arctic Freshwater Bed at West Runton contained floras and faunas of a cold climate whereas the beds between contained forms associated with a warmer climate.

No formal abstract available for this paper.

Bull. geol. Soc. Norfolk (for 1964) **13**, 1-4. (Published October 1965)

SURFACE OF THE CHALK IN NORFOLK

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INTRODUCTION

Studies of the glacial geology of Norfolk by Dr. Banham and the writer have often necessitated detailed descriptions of disturbances of the chalk surface. Most of the structures found can be related to glacial activity.

At Weybourne, the top 5 m of the Chalk is broken into blocks set. in a chalk matrix. The blocks have a preferred orientation (Banham, 1962; Banham and Ranson, 1965). This process has gone further in places to give "re-arranged chalk" (Peake and Hancock, 1961; West and Donner, 1956).

There are many records of the top 10 m or so of the Chalk being deformed to produce shallow folds and even rafts of chalk separated from the main body of the Chalk; at Weybourne, (Banham 1962; Banham and Ranson, 1965), at East and West Runtons, Overstrand, and Sidestrand (Peak and Hancock, 1961), at Taverham, at Whitlingham and Swainsthorpe (Taylor, 1865, 1866), and others.

Much solution and erosion of the chalk surface must have taken place during glacial times. The features produced by these effects are occasionally discovered accidentally in bore-holes and excavations (Funnel, 1958; Well-records in the hands of local water-engineers). Some new evidence has been made available by the construction of the new sewers in Norwich. It seems as though much of the chalk surface consists of what is described as "crumbly chalk" and "putty chalk" by the engineers. The thickest development of this is about 15 m. I have detailed records of all the bores and sections relating to this work. The cause of this deformation of the chalk is unknown; but it must be explained if a complete account of the geology of the area is to be given.

No formal abstract available for this paper.

Bull. geol. Soc. Norfolk (for 1964) **13**, 7-9. (Published October 1965)

REFLECTIONS ON THE THICKNESSES OF SEDIMENTARY FORMATIONS

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INTRODUCTION

There is a need for more quantitative work in stratigraphy. Note how often a vague term like "shallow water" is used. The one measurement which is usually recorded is thickness, and remarkably little use has been made of this. The example quoted in this manner should be considered with certain principles in mind:

i) Sedimentation is absolutely dependent on subsidence (Barrell, 1917); ii) Sedimentation is rarely continuous even thick and rapidly deposited sections contain numerous breaks (Barrell, 1917); iii) In detrital sediments the rate of deposition is more than directly proportional to the median grain diameter; v) However, thick sediments may be, the thickness alone tells us nothing of the depth of water at the time of deposition.

No formal abstract available for this paper. (Presidential address, 1965)

Bull. geol. Soc. Norfolk (for 1966) **15**, 1-8. (Published May 1967)

AN ASSESSMENT OF THE GLACIAL DEPOSITS OF N.E. NORFOLK

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INTRODUCTION

*This assessment is concerned mainly with the glacial deposits associated with the Cromer Till, the Boulder Clay, the Contorted Drift (***sensu** *Reid, 1882) and the Chalky Boulder Clay or Marly Drift of other authors, and my remarks will refer to them unless I state otherwise. The Hunstanton Till is not considered here. The most satisfactory published stratigraphy for the area is that of Reid, (1882, p.2), on which the following table is based.*

				Maximum Thickness
8.	*Boulder Gravel*			*20 m*
7.	*Gravel and Sand*			*25 m*
6.	*Boulder Clay, Stony Loam and Chalky Boulder Clay*			*22 m*
5.	*Sands*			*18 m*
4.	*2nd Till*	}		*5 m*
3.	*Intermediate Beds*	}	*Cromer Till*	*3 m*
2.	*1st Till*	}		*4 m*
1.	*Arctic Freshwater Bed*			*3 m*

This is a composite stratigraphy but, except for the Arctic Freshwater Bed, it may be seen in the cliffs between Overstrand and Cromer.

No formal abstract available for this paper. (Presidential address, 1967)

Bull. geol. Soc. Norfolk (for 1967) **16**, 1-16. (Published December 1968)

INVESTIGATION INTO THE GEOLOGY OF THE SITE OF THE UNIVERSITY OF EAST ANGLIA

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INTRODUCTION

The extensive excavations for the foundations of the University of East Anglia and other buildings have given us the opportunity for detailed study of the geology of the Yare valley between Colney and Cringleford. Work on the University site (TG 194 079) has revealed exposures in the Eaton Chalk division of the zone of **Belemnitella mucronata** *(Peake & Hancock, 1961). This is overlain by a thin but complex deposit of discontinuous sands and poorly sorted gravels lying in the irregularities of the chalk surface.*

The associated gravels, sands, and clays are of variable thickness, being absent in some parts, but generally around 1 m and up to 4 m in one exposure. They are probably glacially mixed forms of either the Norwich Brickearth (we are indebted to Prof. Funnell for this suggestion), or possibly Norwich Crag. These are being investigated for foraminifera, in an effort to obtain more evidence concerning the origin of the superficial deposits. It is also hoped eventually to investigate the series for pollen.

No formal abstract available for this paper.

Bull. geol. Soc. Norfolk (for 1967) **16**, 17-21. (Published December 1968)

A PRELIMINARY ACCOUNT OF RESEARCH BOREHOLES AT BECCLES AND GT. YARMOUTH

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INTRODUCTION

The purpose of this note is to present the initial findings of two research boreholes recently drilled in East Anglia. The two holes are the first of a series of borings in Norfolk and Suffolk which are being carried out by the School of Environmental Sciences, University of East Anglia, and the Sub-Department of Quaternary Research, University of Cambridge, with a grant from the Natural Environment Research Council. The project is intended to increase our knowledge of the stratigraphy and palaeontology of the early Pleistocene Crags and enable us to build up an environmental history of the Lower Pleistocene in East Anglia. Some information on water supply problems is also expected to be obtained. The borings in Suffolk should provide information about the relationships between the Norwich Crag and the Red Crag, and about the Coralline Crag and the Plio-Pleistocene boundary. The boreholes at Ludham described by Funnell, (1961) and West, (1962) provided a great deal of information about the foraminifera, pollen, molluscs (Norton, 1967) and dinoflagellates (Wall and Dale, 1968), and about the climatic history of the Lower Pleistocene in Norfolk, and demonstrated the potential of an extended borehole programme.

BRYOZOA AND THE ORIGIN AND DEVELOPMENT OF THE *CHEILOSTOMATA*

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INTRODUCTION

Bryozoa are among the commonest fossils occurring in marine sediments in the stratigraphical sequence exposed in East Anglia. In particular the rich and well preserved bryozoan faunas of the Chalk and Pleistocene Crags are well known. Localities in the Albian of Norfolk and Cambridgeshire have also yielded some of the earliest known **Cheilostomata**. *The general structure of Bryozoa and their component orders is reviewed and the origin and evolution of Cheilostome bryozoans is considered.*

No formal abstract available for this paper.
Bull. geol. Soc. Norfolk (for 1968) **17**, 10-15. (Published August 1969)

OBSERVATIONS ON IRON MINERAL GEODES IN NORFOLK

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INTRODUCTION

*C.B. Rose, (1836) observed 'geodes, containing sand, small hollow cylinders, and flat fragments of ironstone . . . very abundant' at Shouldham Warren and 'most other localities' on the Greensand outcrop in West Norfolk. They are visible today in a large, shallow quarry 1 mile south of Sandringham Park, occurring in a 7 foot stratum overlying the Carstone. This stratum has yielded geodes of various ferric iron compounds, showing moulds of bivalves (***Triqonia** *sp.) and of wood.*

I have written this short account outlining the difficulties in explaining the origin of geodes since they are abundant in the Crags and in the glaciofluvial and glacial deposits in Norfolk, and frequently catch the eye of anyone looking at these deposits. The literature on this subject is far from helpful: the general view among geologists is that geodes result from concentrations of iron-bearing solutions caused by local lithological variations within porous strata, or by the conversion of iron pyrites. However, neither of these suggestions appears in print.

No formal abstract available for this paper.

Bull. geol. Soc. Norfolk (for 1969) **18**, 4-5. (Published November 1969)

NOTES CONCERNING SOME RHYNCHONELLID AND TEREBRATULID BRACHIOPODS OF THE UPPER CHALK ZONE OF *BELEMNITELLA MUCRONATA* IN NORFOLK

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INTRODUCTION

The zone of **Belemnitella mucronata** *in Norfolk contains an abundant brachiopod fauna. By using the stratigraphical subdivisons proposed by Peake and Hancock, (1961), some suggestions can now be made concerning their vertical distribution. Several hundred individuals have been collected and their external morphology studied. Until a considerable amount of work is done on the internal morphology of these brachiopods no satisfactory specific definitions can be upheld. However, this account, when used in conjunction with the results of studies on belemnites and echinoids, may prove useful to those whose work demands an accurate knowledge of the stratigraphy of the Upper Campanian. In particular; it should help in determining the horizon of temporary exposures.*

No formal abstract available for this paper.

Bull. geol. Soc. Norfolk (for 1969) **18**, 6-12. (Published November 1969)

A PRELIMINARY ACCOUNT OF RESEARCH BOREHOLES AT STRADBROKE AND HOXNE, SUFFOLK

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INTRODUCTION

The previous issue of this Bulletin contained a description of two boreholes, at Beccles and Great Yarmouth, which had been drilled for the University of East Anglia and Cambridge University as part of a research project on the Lower Pleistocene financed by the Natural Environment Research Council (Lord, 1969). The present account describes the second phase of drilling in which two research boreholes were made at Stradbroke and Hoxne. Detailed investigations into the distribution of pollen, foraminifera and other marine microfossils, and the palaeo-magnetic history of! these boreholes are at present being carried out.

No formal abstract or introduction available for this paper.

Bull. geol. Soc. Norfolk (for 1969) **18**, 13-16. (Published November 1969)

INTERGLACIAL BEDS AT BEETLEY, NORFOLK

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INTRODUCTION

The 1964 discovery of richly fossiliferous 'interglacial' beds at Roosting Hills, Beetley, Norfolk, pit of the St. Ives Sand and Gravel Co. is of importance in deciphering the Pleistocene history of Central Norfolk.

The following sequence was exposed in part of the pit:-

H -	*Greenish (greyish when dry) stony silt.*	*c. 1.83 m*
G -	*Pale coloured sand.*	*0.91 ~ 1.22 m*
F -	*Black (grey when dry) silty sand.*	*0.20 ~ 0.23 m*
E -	*Pale coloured, sub-angular sand and gravel.*	*0.25 m*
D -	*Black sand and gravel.*	*0.18 ~ 0.20 m*
C -	*Black (light grey when dry) organic silt.*	*0.64 m*
B -	*Grey-green (greyish when dry) silt sand, with stones and chalk pebbles.*	*0.71 m*
A -	*Coarse, yellow-orange sand and gravel.*	*c. 4.52 m (Max. seen)*

In the northern part of the pit, the organic beds are absent, bed H apparently resting directly on A.

Typical Cannonshot Gravel is exposed in pits higher up the southern sides of the valley (a tributary of the River Wensum) in which the Beetley Beds occur.

No formal abstract available for this paper.

Bull. geol. Soc. Norfolk (for 1969) **18**, 17-19. (Published November 1969)