

25 SEP 1972

QUATERNARY FIELD STUDY GROUP, 1968

COASTAL GLACIAL DEPOSITS
IN CORK, WATERFORD AND WEXFORD

Leaders: E. Colhoun, A. Farrington, G. F. Mitchell,
N. Stephens, F. M. Synge, P. Vernon,
W. A. Watts

Sunday, April 7	Cork - Youghal
Monday, April 8	Youghal - Wexford
Tuesday, April 9	Wexford area
Wednesday, April 10	Wexford - Arklow

July 30, 1984

Botany School,
TCD

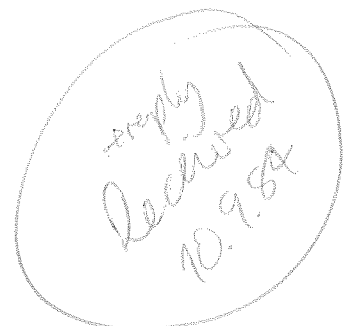
Dear Phil,

I do not know if the QRA has an archive, but I have been intending to send you the enclosed for some time. I am triggered off by the statement on p. viii about a bound QRA field-guide.

At pre-1968 QFSG trips one had been given loose sheets of paper of various sizes, so for the Irish trip I had a bound one (chiefly remembered for the cartoon on the last page). There was then a controversy about page size, before the guides settled down in their present format.

Best wishes,

Fran



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Sunday, April 7

Cork - Youghal

The sites visited will show the relationship between the 'pre-glacial' shore-platform, the overlying beach, the older Ballycroun till of the Irish Sea and Garryvoe till of the Cork/Kerry mountains.

Monday, April 8

Youghal - Wexford

The sites visited will show the relationship between the shore-platform, the beach, a late Gortian/Hoxnian peat and the older Ballyvoyle till of Waterford estuary. We will also see the frost-shattered rock and clitter on the upper slopes of Forth Mountain,

Tuesday, April 9

Wexford area

The sites visited will show the relationship between the younger Cotts deposits of the last glaciation and the older Ballyhealy till (with mixed Irish Sea and local material). An Ipswichian interglacial marine clay and an Allerød late glacial mud will also be seen.

Wednesday, April 10

Wexford - Arklow

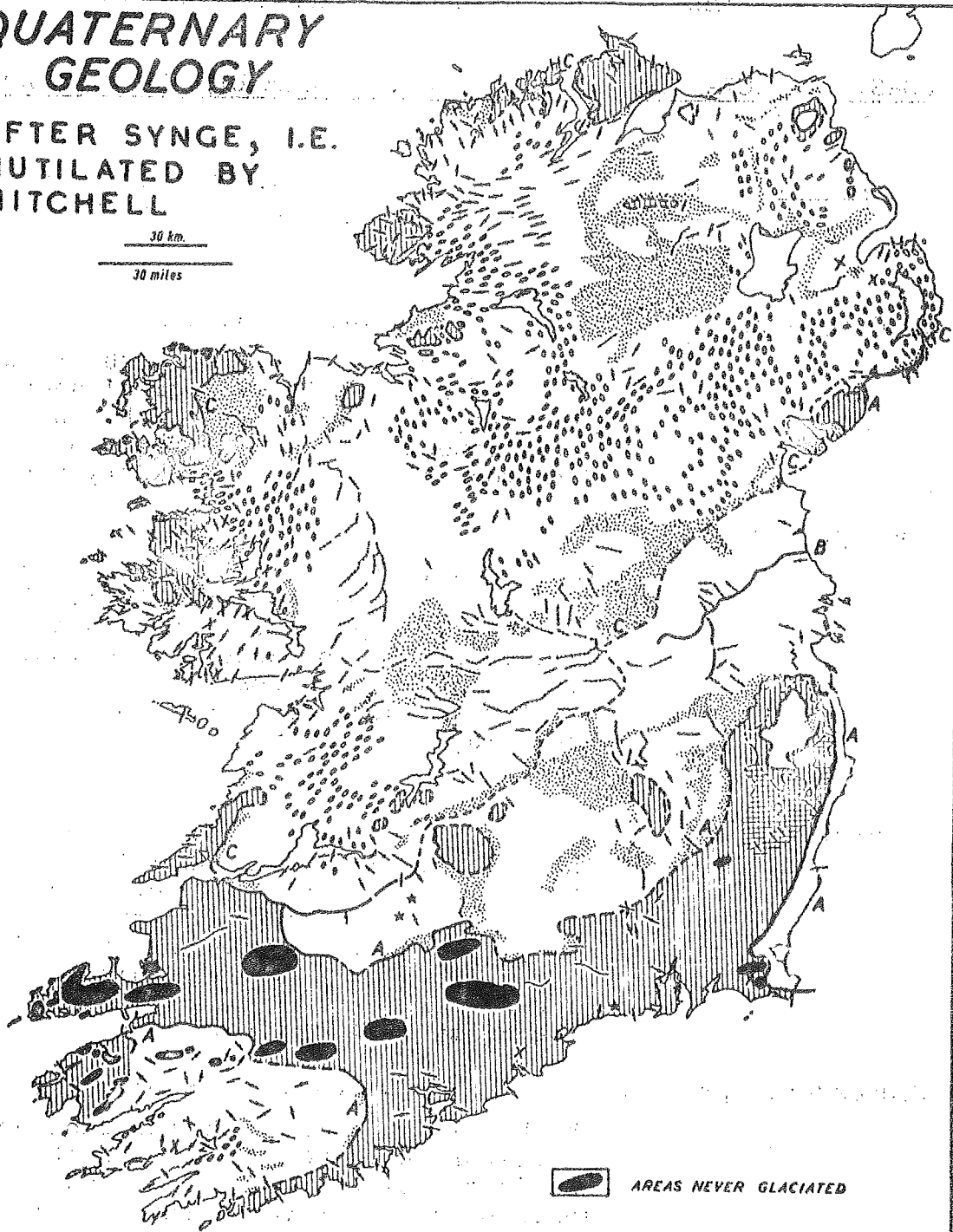
The kettle-moraine at Curraghcloe north of Wexford will be examined on the surface and in the cliff-section. At Cahore a small patch of gravel perhaps of Ipswichian age will be seen. At Arklow a local till will be seen between the striated shore-platform and the calcareous shelly till of the Irish Sea.

QUATERNARY GEOLOGY

AFTER SYNGE, I.E.
MUTILATED BY
MITCHELL

30 km

30 miles



AREAS NEVER GLACIATED

RM	C	B	A	WEICHSEL	RISS	SAALE	* Holstein	MINDEL?	ELSTER?
cial Stages,					Surface Drifts,		Gort	Remanié Drifts,	
SOUTH IRELAND (TIPPERARY) & KILLUMNEY					BALLYCRONEEN TILL		Interglacial		
MORAINES. B. GALTRIM MORAINES					BALLYVOYLE TILL		Sites		
THE DRUMLINS (KELLS) RE-ADVANCE MORAINES									
KAMES	ESKERS	DRUMLINS	STRIAE	MORAINES				STRIAE	

• eem

TENTATIVE CORRELATION TABLE

	IRELAND	WEST BRITAIN	STANDARD
T	Postglacial	Flandrian	Flandrian Warm Period
S	Ballybetagh solifluction- earth	Menteith moraine	Early } D } e } v } e } n Cold } s Period } i
R	Ballybetagh mud	Garscadden mud	
Q	Roddans Port marine clay Donegal high beaches Kells moraine Ardee drumlins	Paisley marine clay	
P	Cotts, Ballylanders Athdown, Killumney moraines	Smestow, Mathry, Llandaff Tregaron moraines	
O		Upton Warren mud	Middle } a
N		Chelford mud	Early } n
M	Cahore beach (?)	Selsey, Portelet beaches	Ipswichian Warm Period
L	Shortalstown marine clay	Selsey mud and clay	
K	Ballyvoyle, Garryvoe, Behy, Fenit till	Pencoed till	Wolstonian Cold Period
J	Garryvoe outwash deposits		
I	Ballycroneen till	Scilly Isles till	
H	Fethard solifluction- earth	New Quay solifluction- earth	
G	Gort, Newtown peat	Hoxne, Nechells mud	Hoxnian Warm Period
F	Courtmacsherry beach	Gower, Fremington beach	
E	Courtmacsherry erratics	Porthleven erratic	Anglian Cold Period
D	Baggotstown, Knock- michael till	Bubenhall till	
C	Courtmacsherry shore- platform	Gower shore-platform	
B	No early Quaternary deposits known	No early Quaternary deposits known	
A	Little known of Tertiary	Little known of Tertiary	

THE SUB-DIVISION OF THE QUATERNARY IN IRELAND

4th Approximation

April 1968

G. F. Mitchell (assisted and restrained by various others)

- A Very little is known of the Tertiary in Ireland (WATTS, 1962)
- B No early Quaternary deposits are known in Ireland
- C A wave-cut shore-platform c. 3 m above modern sea-level is present with some consistency along the east and west shores of the Irish Sea (STEPHENS, 1957), and more intermittently along the south, west and north coasts of Ireland. It was described at Courtmacsherry by WRIGHT & MUFF, 1904. It is probably a composite feature, reworked in successive interglacials. In France a similar platform is cut in deposits of Eocene age. In the Channel Islands and in the Scilly Islands the platform was retrimmed in Ipswichian time, and has Ipswichian beach resting on it.
- D Boulder-clays in Co. Limerick at Baginbun and Kildromin lie below interglacial deposits of Gortian/Hoxnian age. Unless the interglacial deposits are erratics in a younger boulder clay, the boulder clays on which they rest should be of Anglian age in Britain, or Baginbunian in Ireland. A bench of weathered drift at 400' on the north slopes of Knockmichael Mountain, south of Blennerville, Co. Kerry, may also be of this age.
- E The erratics that now lie on the shore-platform (C), either pebbles and small boulders as at Courtmacsherry, or large boulders as at Porthleven (PLETT, 1946) and elsewhere in south-west England, may be of Baginbunian/Anglian age, either derived from till or floated in by ice-rafts.
- F In the Gortian/Hoxnian Warm Period the interglacial sea probably stood about 30 m above modern sea-level, and beaches containing derived erratics accumulated at Courtmacsherry (WRIGHT & MUFF, 1904), Fethard (MITCHELL, 1962), Fremington (MAW, 1864), and many other localities.
- G Freshwater interglacial deposits of Gortian/Hoxnian age are described at Gort (JESSEN, ANDERSEN & FARRINGTON, 1959), Baginbun (WATTS, 1964), Kildromin (WATTS, 1967) and Kilbeg and Newtown (WATTS, 1959). At the latter localities the deposits are covered by boulder clay of Ballyvoyle age (K).

H At the beginning of the Ballycroneenian/Wolstonian Cold Period there was extensive movement of solifluction-earth, producing great masses of head. This deposit is well seen at Fethard, near Fenit in Kerry (MITCHELL, in preparation), and at New Quay in Wales (MITCHELL, 1960).

I A great ice-mass then developed over the mountains of Scotland, Donegal and Connemara, and Cork and Kerry

At first the Scottish ice dominated, and ice moved south down eastern England into East Anglia. There was extensive ice in the English Midlands, where the type Wolstonian deposits are to be found. Ice pressed down the Irish Sea, flowed east up the Bristol Channel to Pencoed, near Swansea (STRAHAN & CANTRILL, 1904), to Fremington near Barnstaple (MAW, 1864, MITCHELL, 1960), surrounding Lundy Island which emerges as a nunatak (MITCHELL, in preparation). Ice flowed along the coasts of Devon and Cornwall, entering the Camel estuary at Trebetherick (MITCHELL & ORME, 1967), and reaching the northern shores of the Scilly Islands (MITCHELL & ORME, 1967). To the west it crossed south-east Wexford (GARDINER & RYAN, 1964) and flowed on as far as Ballycroneen in Cork (WRIGHT & MUFF, 1904). Everywhere the till was shelly and calcareous when first deposited, often with erratics of Ailsa Craig microgranite.

J The Scottish ice then fell back, and shelly outwash sands were deposited. These are seen at Garryvoe, Co. Cork (MITCHELL, 1962).

K Ice in western Ireland then expanded, and flowed south-east into Waterford and Wexford. A lobe moved south down Waterford estuary, where its till buried the Gortian interglacial deposit at Kilbeg (WATTS, 1959), and is well seen on the coast at Ballyvoyle (WATTS, l.c.), and Newtown (MITCHELL, 1962). In the west part of the south coast of Wexford the till is rich in Leinster granite, as at Fethard (MITCHELL, 1962). East of Kilmorequay, e.g. at Ballyhealy, the ice ploughed up the shelly Ballycroneen till and incorporated it into its own debris. From the mountains of south-west Cork ice flowed east, and at Garryvoe its till rests on the deposits laid down by the Ballycroneen ice (FARRINGTON, 1954). Valley-glaciers flowed north from the mountain-ridges of west Kerry, from the Behy valley (LEWIS, 1967) and from the Brandon ranges (MITCHELL, in preparation). The Brandon ice crossed Tralee Bay and deposited moraine on peats of late Gortian age near Fenit.

- L At Shortalstown in Wexford, a marine interglacial clay, probably Ipswichian in age, has been pushed by later ice. This ice, which deposited moraine and kames in south-east Wexford, was probably Devensian in age. There is a large kame at Cotts. The deposit at Ardcavan, Co. Wexford, formerly claimed to be of Ipswichian age (MITCHELL, 1948), is now interpreted as being of lateglacial and post-glacial age.
- M A small pebble deposit, perhaps a beach, at Cahore, Co. Wexford, lies at about 6 m O.D. The deposit, which rests on head, and is buried by calcareous till, probably of Cotts age, may be of Ipswichian age, and correspond with the beaches at Portelet Bay, Jersey (ZEUNER, 1959), the Scilly Isles (MITCHELL & ORME, 1967), and at Westward Ho (STEPHENS, in preparation).
- N Cold conditions then returned, but no deposits of the part of the Last Glaciation that precedes 48,000 B.C. are known from Ireland. In Britain the Early Part of the Devensian includes the deposit at Chelford (SIMPSON & WEST, 1958) which has a radiocarbon age of 57,000 years.
- O Again no deposits are known of the Middle Part of the Devensian, 48,000 - 24,000 B.C. In Britain the Middle Part includes the Upton Warren interstadial complex (SHOTTON, 1959), which has a radiocarbon age of 42,000 years. In Wales there are woods, muds and shells whose radiocarbon age falls in this Middle Period.
- P The main advance of Last Glaciation ice down the Irish Sea probably lies in the Late Part of the Devensian, 24,000 to 8,000 B.C. It may have taken place during the maximum of the Last Glaciation, about 17,000 to 18,000 B.C. (FRYE, WILLMAN & BLACK, 1965). Shells in till of Scottish origin in east Down have given a C-14 date of 22,000 B.C. (HILL & PRIOR, 1968). The ice reached beyond Strumble Head to Mathry in Wales, and went south of Rosslare but did not reach Carnsore Point in Wexford. Inland the morainic limit is not well defined, but there is a large kame at Cotts. The main mass of young moraine lies north of Wexford at Curraghcloe. The ice advanced again into the Cheshire Plain, perhaps as far as Smestow and Wolverhampton (SHOTTON, 1967).

An oval ice-mass, aligned NNE to SSW covered much of Ireland. On the east it flowed into the Irish Sea; to the south it did not go south of Ballylanders (SYNGE, 1966); to the west it failed to cover Achill Island and Belmullet; to the north it failed to cover Inishowen; to the north-east it was in opposition to ice from Scotland.

There was an independent ice-cap in the south-west, and ice advanced east as far as Killumney (FARRINGTON, 1954). There was another ice-cap in the Wicklow Mountains, and ice advanced as far as Athdown (FARRINGTON, 1944).

- Q After an apparent withdrawal ice advanced again, in the south as far as Fedamore (SYNGE, 1966). Drumlins were moulded in the south, and in other parts of Ireland, e.g. in Donegal and around Ardee in Louth. A morainic line through Kells marks the south-east limit of drumlins. In the north-east Irish ice moved south-east across Co. Down to Killough, and north in Co. Antrim (HILL & PRIOR, 1968). Sea-water flooded the isostatically depressed area in the north, emplacing high beaches in Inishowen (STEPHENS & SYNGE, 1965), and clays at lower levels. Marine clays are known at Paisley (JAMIESON, 1865), at Roddan's Port (MORRISON & STEPHENS, 1965), and elsewhere in Co. Down (SYNGE & STEPHENS, 1966).
- R During the well-known Allerød oscillation (10,000 - 8,800 B.C.) mud formed at Ballybetagh (JESSEN & FARRINGTON, 1938), at Garscadden (DONNER, 1959), and many other localities. It is possible that the Bolling (or some similar oscillation) may also be recorded in Ireland (WATTS, 1963).
- S Ice formed in the mountains of Scotland, and at Menteith it ploughed up marine clay of Paisley age (Q), and incorporated the clay in the moraine (DONNER, 1959). Solifluction-earth formed at Ballybetagh (JESSEN & FARRINGTON, 1938), and at many other localities in the British Isles. This stage lasted from 8,800 - 8,300 B.C.
- T Cold conditions came to an end, and the Post-glacial or Flandrian Period opened in the British Isles at 8,300 B.C. (GODWIN & WILLIS, 1959).

ITINERARY

SUNDAY, APRIL 7

CORK - YOUGHAL

The sites visited will show the relationship between the 'pre-glacial' shore-platform, the overlying beach, the older Ballycroneen till of the Irish Sea and the Garryvoe till of the Cork/Kerry mountains.

We leave Cork and drive south over an anticlinal ridge to Ballinhassig (6 m.). We then turn south-west to Inishcarrig (6 m.) on the Bandon River, whose valley we then follow.

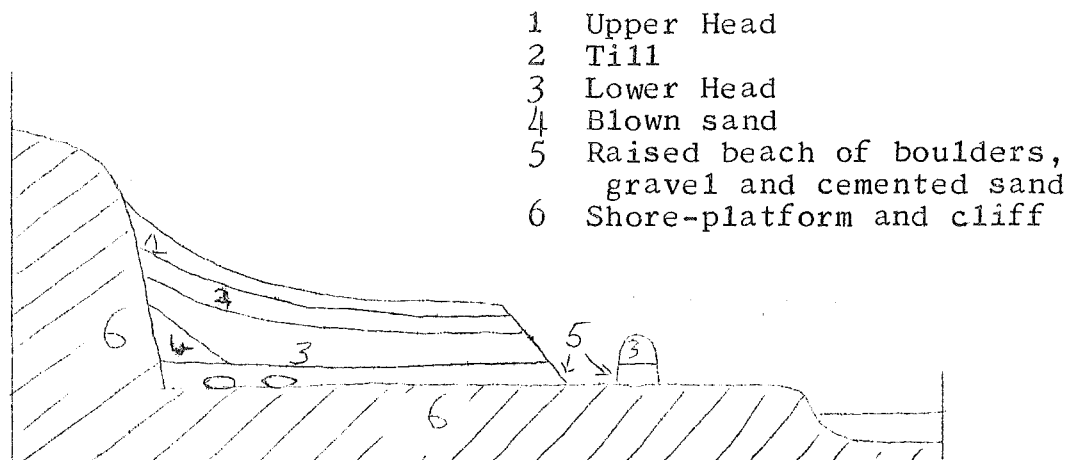
- 1 Here we are on the outer limit of the Last Glaciation in Cork and Kerry (Killumney Glaciation), and at Ballylangley (2 m.) we see pro-glacial gravel and till resting on rock. The drift has a terrace-like form.

We follow the valley to Bandon (2 m.), and then turn south-east to Kilbrittain (6 m.), and the north shore of Courtmacsherry Bay (3 m.), the type site for the raised beach that WRIGHT & MUFF (1904) called 'pre-glacial', but which is now assigned to the Hoxnian/Gortian Warm Period.

- 2 As we cross the modern beach we see

- 1 Made ground
- 2 Blown sand
- 3 Postglacial peat
- 4 Upper Head with ice-wedge-casts
- 5 Till assigned to the Garryvoe Glaciation

- 3 We visit the Howe's Strand section, chosen by Wright & Muff as their 'typical section'.



The till is grey in colour, with Carboniferous slate and O.R.S., and is assigned to the Garryvoe Glaciation.

We return to Cork (28 m.). We then drive east to Dunkettle (4 m.).

4 Here we see at the side of the road

- 1 Poorly sorted gravel, whose upper layers are disturbed by frost-action, showing both involutions and ice-wedge-casts
- 2 Water-abraded rock surface.

The age of this deposit is uncertain.

We continue east along the Cork syncline to Midleton (10 m.). Here we turn south, and crossing an anticlinal ridge reach another syncline at Cloyne (4 m.). Here we turn east to reach the coast (6 m.) beyond Shanagarry.

5 Here if the tide is low we see an extensive area of shattered rock. There is a relatively smooth surface skin of cemented shattered rock. Where this skin has been removed by wave action we see frost polygons with small rounded foreign pebbles and yellow sandy silt involved in the structures. The shattered rock passes down into solid rock. We can picture shore-platform with overlying beach pebbles and finer material being disturbed by frost action in early Ballycroneen time before being over-ridden by Ballycroneen ice. Ballycroneen, the type site marking the farthest advance of the older Irish Sea ice, lies five miles southwest of Shanagarry.

6 We then return to the cliffs of the shore to the type-site for the older drift laid down by ice moving east from Cork and Kerry - the Garryvoe Glaciation. We see

- 1 Cryoturbated surface layer
- 2 Non-calcareous Garryvoe till with local stones
- 3 Outwash sand of Ballycroneen age
- 4 Shelly calcareous Ballycroneen till with flint, chalk, greensand, etc.

The abundance of chalk and derived chalk fossils in the till suggests that chalk must occur in the solid nearby. Chalk has recently been recorded from the sea-floor off Cork.

7 We proceed east to Garryvoe (4 m.) and descend to the shore to see

- 1 Thin cryoturbated Upper Head
- 2 Shelly Ballycroneen till
- 3 Lower Head, cryoturbated at top
- 4 Courtmacsherry raised beach
- 5 Shore-platform

We return to the buses, and drive north-east through Ballymacoda (2 m.) to Youghal (6 m.).

MONDAY, APRIL 8

YOUGHAL - WEXFORD

The sites visited will show the relationship between the shore-platform, the beach, a late Gortian/Hoxnian peat, and the older Ballyvoyle till of the Waterford estuary. We will also see the frost-shattered rock and clitter on the upper slopes of Forth Mountain.

We leave Youghal and cross the Blackwater River (2 m.), as it emerges from its gorge through the anticlinal ridge. We see thick head at the bridge approaches on both sides of the river. There is a deep channel below the bridge (ORME, 1964). We cross the Drum Hills, and look down into the broad synclinal valley in which Dungarvan (16 m.) lies. There are numerous caves with Elephas primigenius and other late Pleistocene mammals. We proceed north-west from Dungarvan to Waterford (28 m.).

From Waterford we drive seven miles south-east to reach the shore of Waterford Harbour at Newtown, two miles south of Passage East. Here the section on the left will be seen; it divides into three units.

- 8a After walking down a lane to the shore, we meet this unit first. The shore-platform (7) is well developed, and its upper surface below the till (2) is disturbed by cryoturbation.
- 8b In this unit beach gravels (6) with numerous erratics are cemented to the shore-platform. The cemented gravels can be traced below high-water mark. In many places a thin micaceous brown silt covered by a thin compacted and contorted peat (5), indicating pine forest with local willow and birch scrub, interrupted by patches of heath, rests on the beach. A yellow upper silt (4) covers the peat. All this unit is sealed by till (2). This unit is often obscured by recent beach material and by slumped till.
- 8c In this unit we see at the base a layer of yellow sand and silt (4) about 2 m thick, buried by head (3), which in turn is covered by a thick mass of till (2), calcareous in places and with occasional blocks of Carboniferous limestone among its erratics. As the ice advanced it picked up blocks of rock, head, and organic muds and silts (with Hoxnian/Gortian pollen), and these were sheared into thin layers which can be traced in the till. This till is the equivalent of the till which covers the Kilbeg interglacial deposit (about 15 m. west) of Hoxnian/Gortian age, and appears on the coast at Ballyvoyle Head near Dungarvan (WATTS, 1959). Fabric analysis suggests that it came from

the north-west (STEVENS, unpublished). It may have swept away previously deposited Ballycroneen till. The top of the till is disturbed by cryoturbation (1). It would appear that as sea level fell at the end of the Hoxnian/Gortian interglacial storm beaches were abandoned on the shore-platform. Ponds formed between the beach ridges, and in the ponds silt and peat formed. Frost action developed, and silt and head moved down. Where the shore-platform was not covered, cryoturbation disturbed its upper layers. Ice advanced and picked up blocks of interglacial muds and silts of Hoxnian/Gortian age, head and rock; the blocks were drawn out into sheets intercalated in the till. After the withdrawal of the ice, later frost disturbed the upper layers of the till.

We return to Waterford, noticing at Callaghane Bridge a sinuous ridge of sand and gravel, with some limestone both fresh and weathered.

As the lowest bridge across the Barrow is at New Ross, we must first drive twelve miles north-east, cross the river which is still tidal at New Ross, and then drive fifteen miles south to Fethard.

- 9 The section near Fethard is illustrated on the left. My interpretation is as follows - At the south end of the section we see the shore-platform abutting against the old cliff. Beach deposits of Courtmacsherry age lie on the platform, and are also seen at the base of the cliff farther north, where the shore-platform has dropped below the modern beach. The shore-platform can be traced seaward to low-tide mark, and has patches of beach gravel cemented to it. It is suggested that the beach lying below high-water mark at Heatherslade in Gower (GEORGE, 1932) corresponds with this material at Fethard. Erratics can be seen in the beach material.

Stratified head lies on the beach, and builds up the bulk of the cliff section. The head varies in colour from brown to ochre-red, which suggests that the material of which it is composed had been deeply weathered before being emplaced by frost-action early in the Wolstonian Cold Period. In places the head is very coarse, which suggests that the rock-cliff is not far behind. The head moved downslope in a viscous state, and the section gives an impression of folding. The overlying till is non-calcareous and sandy. It contains many boulders of Leinster granite, which suggests that the ice-stream came from the north. Many of its stones are standing vertically, and thin grey 'wedges' pierce it from above. These 'wedges' represent cracks which have given opportunity for water movement which has reduced the iron in the vicinity of the crack, but there has been no displacement or rotation of stones in the

vicinity of the crack. If the tide is sufficiently low there will be seen at the north end of the section this level of the till dissected by the sea. Vertical stones are seen everywhere, and the 'wedges' are seen to intersect in a polygonal fashion. They contain recent roots and wood. Are the cracks produced by frost, or are they produced by dessication? They must antedate part of the postglacial rise in sea-level.

- 10 We proceed three miles north to Saltmills, where a low section is seen round the margins of a hillock on the foreshore. The till at the base is deeply weathered and frost-disturbed, and shows splendid polygonally arranged 'wedges'. Similar 'wedges' are seen at Marros in Carmarthenshire (BOWEN, unpublished), and south of the Loire in Brittany (MITCHELL, unpublished). On the west the till is buried by gravel, and on the east it has deep solifluction pockets or channels. The tops of these structures are truncated, and still later solifluction must have removed the upper layers, and produced the remarkably flat surface which conceals the dramatic disturbances below.
- 11 We drive north-east round the head of Bannow Bay to Welling-tonbridge (4 m.). We continue towards Wexford for 5 m., and then turn 4 m. south-east to Baldwinstown, where in a very limited exposure we see the degraded remains of a terra rossa soil on top of Carboniferous limestone. (This stop will be omitted if time is short.)
- 12 We return to the Wexford road, but leave it again after 2 m., this time turning north to rise to a height of 600' on the western slopes of Forth Mountain (779'). The mountain is of quartzites, slates and shales, probably of Cambrian age. Here we see frost-shattered tors with a boulder-strewn slope leading down and away from them, suggesting that frost-shattered material at this level was not removed by ice. We return to the Wexford road, and run along the south slope of the Forth Mountain ridge.
- 13 Three miles farther on we reach a crossroads at Clonard, and pause briefly to contemplate the complexity of the glacial deposits of Wexford. Behind and above us is the shattered Cambrian (?) debris. To the north lies Clonard Little, one of the classic sites for the 'Wexford Manorial Gravels' of the older literature (see McMILLAN, 1964). In the valley ahead is weathered till with mixed local and Irish Sea material. In the lowland to the south there are deposits of the Last Glaciation. We continue into Wexford (2 m.).

TUESDAY, APRIL 9

WEXFORD AREA

The sites visited will show the relationship between the younger Cotts deposits of the Last Glaciation and the older Ballyhealy till (with mixed Irish Sea and local material). An Ipswichian interglacial marine clay and an Allerød lateglacial mud will also be seen.

- 14 We turn south from Wexford, and at Kerloge, at about 100', see bare quartzite reefs showing some signs of ice-smoothing.
- 15 We drive 9 m. south-east to St Helen's, south of Greenore Point, where we see calcareous shelly till with few stones resting on a striated rock surface. The top of the till carries a gleyed soil, the Macamore soil, but is not significantly affected by frost-working. The till is ascribed to the Last Glaciation.
- 16 We proceed south to Ballytrent (2 m.) where we again see a calcareous shelly till, but here with a high stone content and some stratification. The base of the section is now obscured by blown sand, but MITCHELL has notes of a visit here in 1947, with K. JESSEN and A. FARRINGTON, when there was no blown sand, and a weathered till was seen below the shelly till. This till could be again revealed by excavation or drilling, and this site might then become the type site for the limit of advance in Ireland of Irish Sea ice during the Devensian Cold Period. The actual limit lies 1 m. farther south at St. Margaret's, where there is an isolated kame.
- 17 From Ballytrent we drive west (2 m.) to the channels leading down to the head of Lady's Island Lake. These are melt-water exits from Last Glaciation ice, and the basin of the lake was probably also cut by melt-water.
- 18 We continue on to Cotts (3 m.), where we walk to the top of a large kame (129') of stratified shelly sands and gravels with some large boulders. This hill is the most prominent feature on discontinuous morainic line which runs in a semi-circle from Wexford to St. Margaret's. Along the line we have coarse-textured Killinick and Broadway soils; within the line we have the heavy-textured Macamore soil on the boulder clay. Because of the prominence of the feature the name 'Cotts' is given to this advance of the Last Glaciation in Wexford.
- 19 We continue west (2 m.), where at the sides of an entrance we see on the right stratified shelly gravels of Cotts age, and on the left cryoturbated non-calcareous till. Does the entrance mark the limit of the Last Glaciation?

- 20 We drop down into a valley from whose floor bosses of rock protrude. Here we are near the head of Tacumshin Lake, and were we to move downstream rock would become more and more prominent. This is another melt-water exit, and the rock has appeared because the overlying older till was stripped away by melt-water of the Cotts ice. The scalloped north shore of Tacumshin Lake is due to dissection by melt-water.
- 21 Leaving the valley we cross into a different landscape with smooth slopes, and turn down to the coast at Ballyhealy (3 m.). Here we see in places at the base of the section calcareous shelly till with Irish Sea erratics, which is overlain by rather similar till but which has in addition much local material. Marked push structures are seen in places. When the ice first abandoned these push structures, the topography must have been irregular. But the topography is now smooth, and the till is deeply weathered. The Irish Sea till must be of Ballycraheen age, the till with local material (Ballyhealy till) must be the Wexford equivalent of the Ballyvoyle till, and the smoothing of the topography must be due to solifluction during the Last Glaciation. These tills continue west to Kilmorequay, where they rest on head, cryoturbated Courtmacsherry beach, and shore-platform.
- 22 From Ballyhealy we turn north-east and cross back from the smooth topography into morainic topography of Cotts age near Mayglass (4 m.), where we pass another kame.
- 23 Another 2 m. to the north-east we arrive at Shortalstown, where at ca 80' O.D. a drainage scheme has recently revealed marine interglacial and freshwater lateglacial deposits (see sketch-section opposite). Where the drainage trench cuts through a ridge, an interglacial marine silt, with molluscs, foraminifera, ostracods, seeds and pollen, is seen to have been pushed by ice of Cotts age. The silt should therefore be of Ipswichian age, and this age is compatible with the results of the preliminary study of the fossils. A stratified gravel over the silt at one point may well be a beach deposit. Unweathered silt is only seen at depth, but there is much weathered material of similar texture in the walls of the trench, and the marine material may originally have been quite extensive. It has been very severely disturbed by ice. To the west a small hollow in the till shows
- 1 Grey clayey silt moved by agricultural activities
 - 2 Thin layer with humus and charcoal related to an old cooking-place
 - 3 Grey clayey silt

- 4 Brown open-water mud with Potamogeton, Menyanthes, moss, beetles and bones of Cervus giganteus, almost certainly Zone II in age
- 5 Clay-mud with moss and Betula nana, probably Zone I/II in age
- 6 Stone-free clay, probably Zone I in age
- 7 Till of Cotts age

- 24 By a circuitous route we reach a morainic ridge running south from Piercetown, 1 m. north-east of Shortalstown. The ridge shows an ice-contact slope on its eastern flank.
- 25 From Piercetown we rise upslope to Johnstown (1 m.), and in doing so rise above the limit of the Last Glaciation. Running north-east to Wexford (3 m.) we cross the eastern end of the Forth Mountain ridge at about 250'. Here we are above the ice-scouring of the Last Glaciation at Kerloge (14), and below the frost-shattered clitter. We see bosses of quartzite rising through drift of Ballyhealy type. We drop down into Wexford.

WEDNESDAY, APRIL 10

WEXFORD - ARKLOW

The kettle-moraine at Curraghcloe north of Wexford will be examined on the surface and in the cliff section. At Cahore a small patch of gravel perhaps of Ipswichian age will be seen. At Arklow a local till will be seen between the shore-platform (striated at this site) and the calcareous shelly till of the Irish Sea.

- 26 We cross the Slaney, and at the far end of the bridge see calcareous shelly till of Cotts age. In places it is weathered to a considerable depth; it shows signs of deformation and kneading. We also see a thin peat and granite sand resting on the till; the peat is probably lateglacial in age.

The site at Ardcavan, long claimed to be of Ipswichian age (MITCHELL, 1948, etc.) lies 1 m. to the east; it is now regarded as lateglacial and postglacial.

- 27 Proceeding north-east for 4 m., we reach the huge Curraghcloe moraine. As long as Ardcavan was thought to be interglacial, this moraine was very reasonably considered to mark the outer limit of the Last Glaciation in Wexford. Now that Ardcavan is discredited, this moraine may mark a halt in the retreat from the Cotts limit, or represent a re-advance. The moraine has a tumultuous surface and many kettle-holes; it rises to a height of 334'.
- 28 We move two miles east to the coast at Ballinesker, where we walk north along the shore to see the Curraghcloe moraine in section.
- 29 We drive three miles north to Blackwater where we see another high ridge of moraine running north-west/south-east.
- 30 We drive ten miles north-east to Cahore, where we see a small patch of rounded gravel (SYNGE, 1964). The sequence is
- 1 Shelly calcareous till (of Cotts age ?)
 - 2 Horizontal well-rounded pebbles (beach ?)
 - 3 Head with washed surface
 - 4 Shore-platform

The pebbles are at about 20' O.D., and it is tempting to interpret them as a beach of Shortallstownian/Ipswichian age.

We continue north to Courtown (6 m.), north-west to Gorey (4 m.), and north-east to Arklow (10 m.). Between Gorey and Arklow we have gravels and till of Cotts age; the till carries the typical Macamore soil with impeded drainage, and many fields are badly infested with rushes.

31 One mile north-east of Arklow, we see at Seabank Point

- 1 Shelly calcareous till, probably of Cotts age
- 2 Shelly gravels, probably of Cotts age
- 3 Non-calcareous till, with local stones, probably of Ballyvoyle age
- 4 Shore-platform with striae at 160°

SYNGE (1964) regards the calcareous till as Ballycroneen in age, with the lower till (3) a Clogga till still earlier in date.

We return to Arklow, where we leave those members of the party who wish to return to Rosslare by train.

The rest of the party will proceed in the buses to Dublin (44 m.), passing extensive gravels of Cotts age and several overflow channels en route.



HOW A LATE
GORTIAN/HOXNIAN
ERRATIC RAME
TO THE TILL

ROUTE MAP

