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THE CONTEMPORANEITY OF THE RIVER TERRACES OF THE MARIBYRNONG RIVER, VICTORIA, WITH THOSE OF THE UPPER PLEISTOCENE IN EUROPE.

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Plate XV.

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The examination of the terraces of the Maribyrnong River valley was undertaken to prove the antiquity of what has come to be known as the Keilor skull. There is now reason for believing that the skeleton may have been a burial, and the age of the terrace in which it was found is not necessarily its age. Nevertheless, although the skull is suspect, the investigation was in the much neglected field of Victorian Pleistocene geology, and is an attempt to correlate the Maribyrnong River terraces with those of the Ice Age of Europe. Doubtless, the correlation will facilitate an understanding of the ecology of the Recent and Pleistocene fauna and flora concerning which little is known in Australia.

Early in October, 1940, the Keilor skull was found with fragments of limb bones in Hughes's sand pit near the junction of Dry Creek and the Maribyrnong River, a mile north of the Keilor township. In the following December the approximate site was inspected by Messrs. Mahony, Brazenor, and Keble, of the National Museum, the circumstances of the discovery being later partly detailed by Mahony (1943), together with papers on the anatomy of the skull by Wunderly (1943), and on the palate and upper dental arch by Adam (1943). Hughes's sand pit is excavated in a river terrace (Pl. XV, Fig. 1) referred to by us as the Keilor Terrace. The skull and bones were stated to have come from one level 18 feet below its surface, and within a few feet horizontally. At the site where it was discovered, the surface of the Keilor Terrace adjoining the pit had been lowered 9 feet by excavation of sand for industrial purposes; the wall of the pit is 9 feet high.

We have endeavoured in this contribution

(i) to determine the sequence of flood plains and terraces formed in the Maribyrnong River valley since the extrusion of the Keilor Plains basaltic lava on which the valley was formed. The Keilor Flood Plain is the final manifestation of the Keilor cycle of erosion—the first cycle on the Keilor Plains lava field. It was followed by two cycles of erosion—the Braybrook and Maribyrnong Cycles, and

(ii) to tie up these flood plains and terraces with the last post glacial 15 to 20 feet eustatic fall of sea level. Evidence of this rise is seen (Fig. 1) in the Yarra Delta, and on the shores of

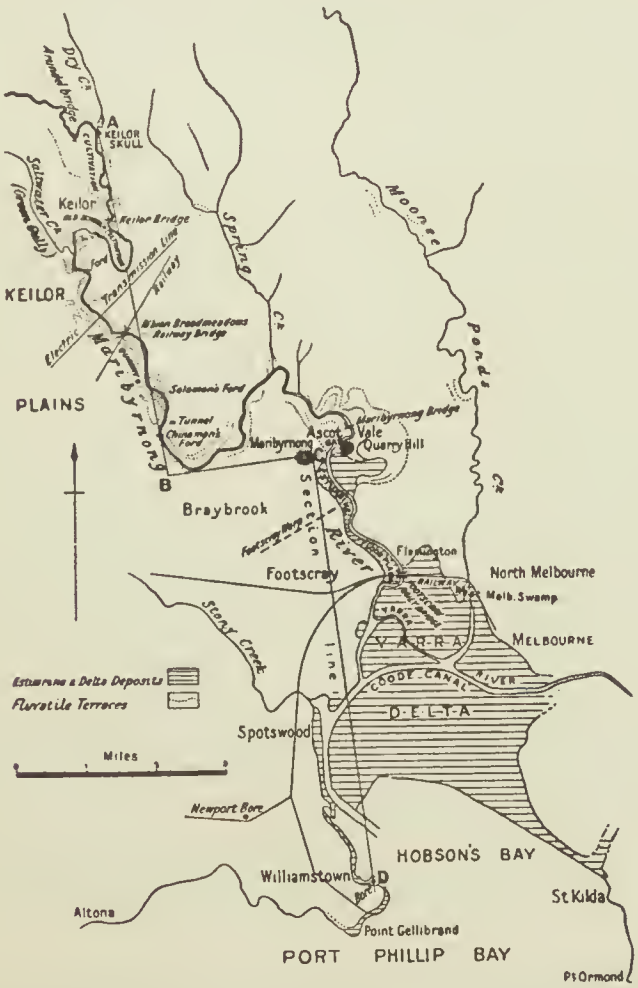

FIG. 1.

Map showing the Maribyrnong valley between Dry Creek and Port Phillip Bay.

Port Phillip Bay both east and west of the outlet into the Bay of the confluent Maribyrnong and Yarra Rivers.

The Maribyrnong valley and its fluviatile deposits downstream from Dry Creek have been examined, and the levels of the terraces and river bed determined. The datum to which heights are referred is low water mark at Williamstown (the datum commonly used in Victoria) and referred to hereafter as L.W.M.

The mean diurnal range of tide at Williamstown is 2 feet. Bench marks have been fixed by the Victorian Railways Department and the Country Roads Board at points between Dry Creek and the Bay. Between these official bench marks, at intervals of about 500 yards, subsidiary bench marks were fixed with a dumpy level, and the heights of the terraces ascertained from these by us with an Abney level. Where our levels of the terraces were checked by more exact methods, our error was found to be less than a foot.

Hughes's Sand Pit and the Adjoining Area

The human remains were associated (Pl. XV, Fig. 2) with a sinuous band of greyish-red sand, about two inches thick, in which are thin layers of calcined bones, ashes, and fragments of red ochre, indicating an occupational level. Thin layers of ash, a few feet long, were observed on the south side of the pit, about 4 feet above its floor but not elsewhere. Protruding from the two-inch band a quartzite flake was found by Professor E. S. Hills of Melbourne University, while he was inspecting it with us; the flake is illustrated by Mahony (1943). Many small flakes found on the floor of the pit may have come from the terrace sands, or have fallen from the surface when sand was being removed.

The sand forming the bulk of the terrace consists of small, well rounded quartz grains, together with some larger, less rounded grains; in addition there is sufficient clay to bind the whole into a compacted mass. Below the floor of the pit, the sand becomes coarser, and the base of the terrace, where visible on the bank of the river, is composed of coarse sand, grit, pebbles, and boulders.

The three terraces—the Keilor, Braybrook, and Maribyrnong Terraces—in Dry Creek, have been mapped (Fig. 2) by us. Their surfaces are respectively 45 feet, 38 feet, and 27 feet above the bed of the River. The surface of the Keilor Flood Plain is 103 feet above L.W.M.

In Dry Creek, the Keilor Terrace was originally over 150 yards wide and 32 feet thick, but it has been reduced in width and thickness by erosion; it is best preserved on the west side of the Creek.

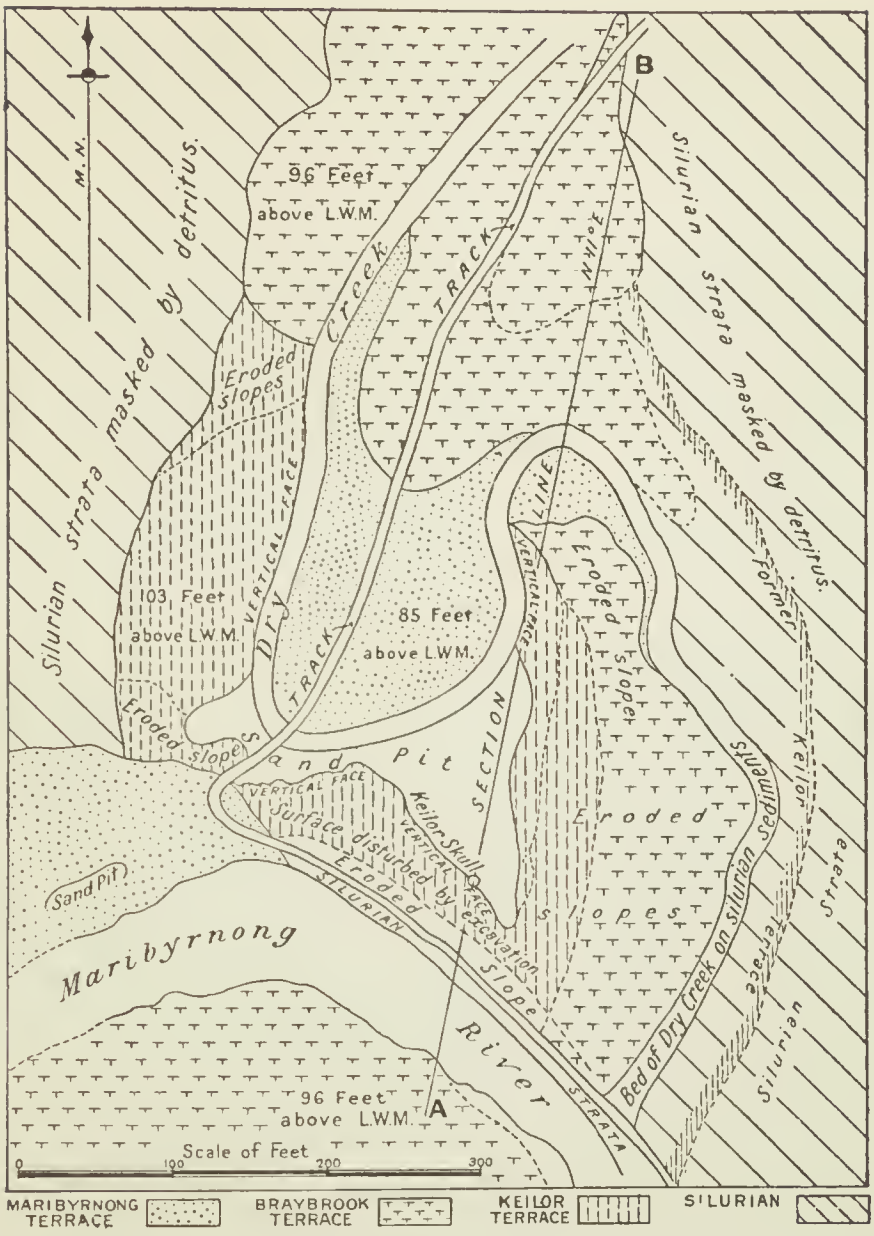

FIG. 2.

Geological Map of the Area at the Confluence of Dry Creek and the Maribyrnong River, showing Hughes's Sand Pit.

The widest portion of the Braybrook Terrace still preserved in Dry Creek is above the Sand Pit; it is a paired terrace over 80 yards wide and 15 feet thick. At the Sand Pit itself erosion has removed all but a small portion on the right bank of the creek.

On the right bank of the Maribyrnong River opposite the confluence of the creek this terrace is fairly extensive. The remnant of the Maribyrnong Terrace in Dry Creek valley is small, but it is developed extensively in the river valley a short distance downstream.

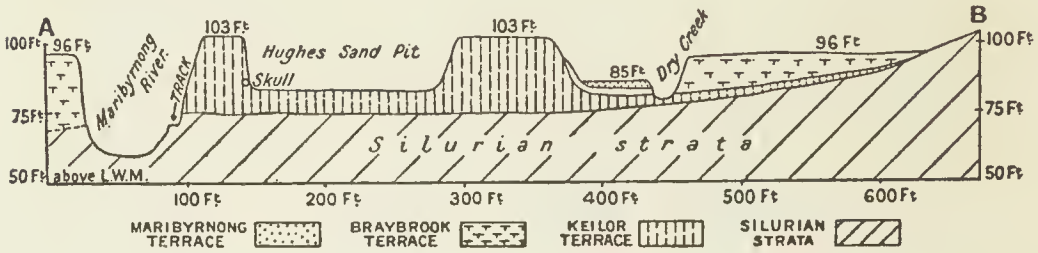

FIG. 3.

Section along a Line (AB, Fig. 2) passing through the Terraces and Sand Pit, at the Site of the Discovery of the Keilor Skull.

The Maribyrnong River and Dry Creek

The Maribyrnong or Saltwater River is the longest tributary of the Yarra River, which it joins near Spotswood (Fig. 1). It rises in the Cobaw Ranges north of Macedon, flows eastwards towards Lancefield, and then turns in a southerly direction to its junction with the Yarra. For many miles its valley is cut through Newer Volcanic lava (New Basalt) into the underlying rocks.

River gaugings taken at Keilor by the State Rivers and Water Supply Commission, Victoria, show that its mean discharge is 90 cubic feet (560 gallons) per second, and that its flow stops, or almost ceases, for two or three of the dryer months each year. The highest recorded flood level was 35 feet above the river bed. The Commission estimates its drainage area above Keilor at 550 square miles.

At Keilor, the valley is about a mile wide, 100 feet deep, and flat-bottomed. In it are extensive alluvial deposits. Downstream it narrows from half to quarter of a mile wide and becomes shallower. Below Ascot Vale Gap it opens out on to the wide alluvium of the Estuarine Flood Plain (Fig. 6) which is about 10 feet above sea level. The Estuarine Flood Plain merges into the Yarra Delta. Below Chinaman's Ford the river is tidal.

Dry Creek is a small gully, 4 miles long, which descends from the basalt plateau to the river, a fall of about 130 feet. It carries water only after rain, and is graded near its confluence. By Recent vertical erosion, it has cut through the terrace material into the underlying Silurian strata to a depth of about 8 feet.

Age of the Keilor Plains Basalt

The Keilor Plains basaltic lava averages about 45 feet in thickness, and is one of the series of flows known in Victoria as the Newer Basalt.

We have recognized two phases in the Newer Basalt. During the earlier one, the great lava fields such as those of the Keilor Plains and the Western District were formed. The later or scoria cone phase extended well into the Recent, and during it, scoria cone flows issued from points of eruption on the great lava fields and the highlands to the north. The Keilor Cycle of erosion commenced on the Keilor Plains lava field immediately after the lava covered the area. There is, however, a difference of opinion as to the age of this lava field. Hills (1939), on physiographical evidence, came to the conclusion that it was certainly post-Kalimnan (Lower Pliocene) but that there is nothing to indicate whether it is Pliocene or Pleistocene. In consequence of this uncertainty, we have fixed the age of the Maribyrnong River valley cycles by working backwards from the last eustatic 15 to 20 feet fall of sea level (indicated by platforms and ridges on the Yarra Delta and the shores of Port Phillip Bay), not by working forwards from the Keilor Plains lava field. Nevertheless, the evidence as to the age of the lava field, which restricts the downward extension of the physiographic cycles, seems to support our correlation of the cycles, and we have discussed it at some length.

Immediately beneath the Keilor Plains basalt is a widespread bed (referred to here as the "Sub-Basalt Sands") that is predominately sand, but sometimes consists of clays, sandstone, grit, pebbles, etc. It has a thickness of about 40 feet in the neighbourhood of Keilor, but about 80 feet south of the Ascot Vale Gap. It was evidently deposited on a peneplain, and after it was deposited, presented a peneplain surface to the enveloping lava. The only fossils recorded from it (Crespin, 1926) are unrestricted freshwater mollusca, *?Cyclas* or *Unio,* and sponge spicules, *Spongilla.*

The nearest place to the Maribyrnong River valley where evidence of the age of the Newer Basalt can be ascertained with some certainty is at the Moorabool Viaduct, about 30 miles to the south-west. Here the Newer Basalt overlies ferruginous sandstone, which rests on marine fossiliferous Werrikooian or Upper Pliocene beds. Singleton (1941) discusses the viewpoints held by Dennant; Tate and Dennant; Tate, Hall and Pritchard; Dennant and Kitson; Chapman; and Singleton, on the age of these fossiliferous beds; these differ mainly as to whether it should

be assigned to the Upper Pliocene or Lower Pleistocene. He summarises the evidence by remarking that "a critical study has shown that five per cent. of the mollusca are extinct species, so that the Werrikooian may be placed in the uppermost Pliocene, immediately preceding the Pleistocene, with a molluscan fauna of living species only." As the Newer Basalt at the viaduct rests in a shallow valley in the ferruginous sandstone (Pliocene-Pleistocene)—a valley that represents a short time interval between the depositing of the sandstone and the extrusion of the basalt, Singleton's summary leads to the conclusion that the basalt is Pleistocene. Nevertheless, although the Keilor Plains and the Moorabool Viaduct basalts have been assigned to the Newer Basalt, they are so far apart that we cannot be certain that the flows are wholly contemporaneous.

It would be possible to fix the age of the Keilor Plains basalt if there were means of estimating the time taken for the vertical erosion of the Keilor Cycle. However, assuming on the inconclusive evidence that the basalt is Pleistocene, and the sequence of the Maribyrnong River valley flood plains and terraces is Upper Pleistocene, the lava field is Middle Pleistocene.

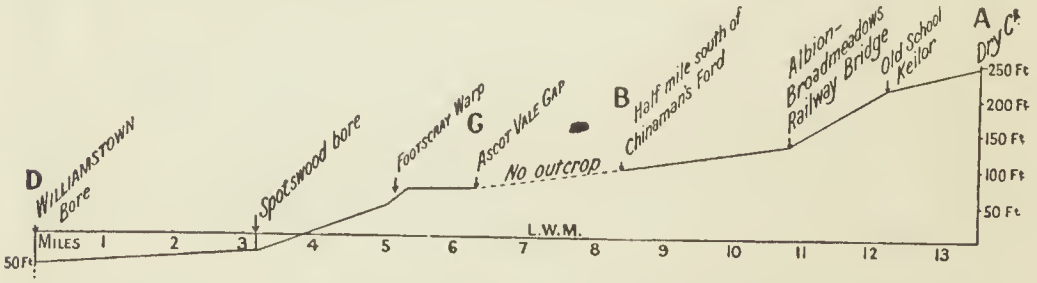

FIG. 4.

Levels between Dry Creek and Williamstown of Contact of Lower Surface of Keilor Plains Basalt with Sub-Basalt Sands.

Warping and Tilting

Although the Keilor Plains lava field is warped and tilted, eustatic adjustment, not tectonic movement, is regarded as responsible for the deposit and subsequent terracing of the Keilor and Braybrook Flood Plains. It is also responsible for the deposit of the Maribyrnong Flood Plain, and, for the most part, its terracing; warping has contributed to this, but to an insignificant extent.

The Keilor Plains lava field, and the Sub-Basalt Sands, are tilted in a south-south-easterly direction. The tilting occurred along zones of warping approximately parallel to the north-west

shore of Port Phillip Bay. One zone crosses the Maribyrnong River between Albion-Broadmeadows railway bridge and the old Keilor school (Fig. 4); another—the Footscray Warp—is evident in the section (Fig. 4) on the west side of the River at Footscray, about a quarter of a mile north of the Ballarat Road. The tilting on the Footscray Warp brought about the complete submergence of the Port Phillip Sunklands—Port Phillip Bay then assumed its present form. No fracture lines are known in any part of the Maribyrnong River valley or the Keilor Plains lava field.

Fluviatile Deposits of the Maribyrnong Valley

The earliest reference to terraces in the Maribyrnong River valley appears to be that of Officer (1893) at Keilor, while Hills (1939) noted paired terraces at West Essendon and at Maribyrnong (Ascot Vale Gap).

All the flood plains subsequent to the Keilor Flood Plain were formed of the resorted material of that flood plain, and are lithologically similar. The only way of distinguishing between them is by noting their relative positions in the field, and by accurate levelling. There are no traces in them of volcanic ejectamenta from adjacent scoria cones such as the tuffs of the Camperdown area (Grayson and Mahony, 1910), and this indicates that none of these scoria cones were in eruption while the flood plains were being formed.

The six major episodes evident in the development of the Maribyrnong River from Dry Creek to Ascot Vale Gap are:

First, a cycle of erosion—the Keilor Cycle—which started on the Keilor Plains lava field. During this cycle, the valley was vertically eroded, the erosion reaching the beds underlying the basalt; this was followed by lateral erosion, when the Keilor Flood Plain was deposited to a depth of 45 feet.

Second, a cycle of erosion—the Braybrook Cycle—during which the Keilor Flood Plain was entrenched, the Keilor Terrace formed, and the Braybrook Flood Plain deposited.

Third, a cycle of erosion—the Maribyrnong Cycle—during which the Braybrook Flood Plain was entrenched, the Braybrook Terrace formed and the Maribyrnong Flood Plain deposited.

Fourth, the beginning of a cycle of vertical erosion, due partly to eustatic adjustment and partly to the Footscray Warp, during which the Maribyrnong Flood Plain was entrenched, and the Maribyrnong Terrace formed.

Fifth, Post-glacial 15 to 20 feet eustatic rise of sea level shown by wave platforms, and ridges that were submarine banks on the Yarra Delta and the shores of Port Phillip Bay.

Sixth, eustatic fall of sea level, and resumption of the vertical erosion started in the fourth episode.

The Keilor and the Braybrook Terraces occur at short intervals between Dry Creek and Ascot Vale Gap, and the Maribyrnong Terrace as far downstream as the Footscray Warp. The Maribyrnong River has been entrenched upstream from the Yarra Delta; it formerly flowed east of Quarry Hill, but the entrenchment was responsible for the breaching of the rock barrier west of Quarry Hill, to form the Ascot Vale Gap. The material removed has been progressively deposited in the entrenchment, and has formed the Estuarine Flood Plain and the Yarra Delta. The Estuarine Flood Plain is a northerly prolongation of the Yarra Delta, and is mapped by Aplin (1858) at the direction of A. R. C. Selwyn (then Director of Geological

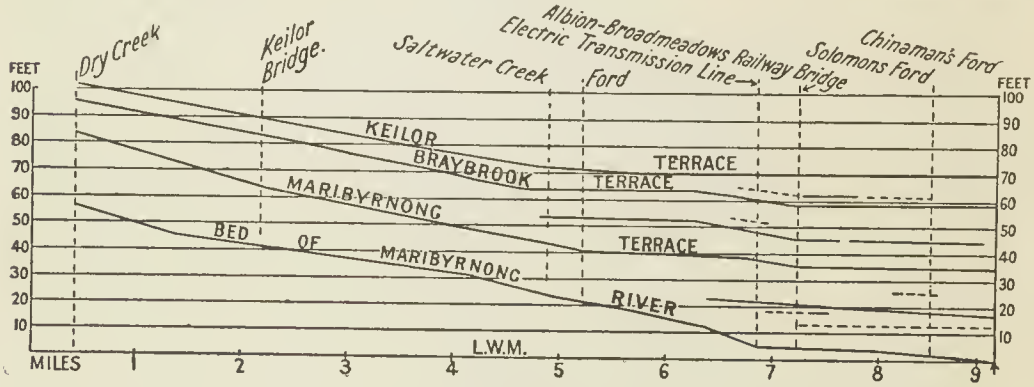

FIG. 5.

Profile of Surfaces of Terraces and Bed of Maribyrnong River between Dry Creek and Chinaman's Ford.

Survey) on Quarter Sheet 1 N.W. as "Post Pliocene-raised beaches, estuary beds, etc." The surface bed consists of 3 feet of grey soil resting on 5 feet of yellow clay. Both beds are unfossiliferous, but crossing the Estuarine Flood Plain, a short distance below the Ascot Vale Gap, is a drain in the bottom of which, and also in the excavated material beside it, are a number of Recent estuarine shells that may have come from a bed hidden beneath the silt in the drain. It is scarcely necessary to add that such a careful observer as Selwyn would not record the estuarine nature of the Flood Plain without definite evidence of such.

The Keilor, Braybrook, and Maribyrnong Terraces have not been preserved between the Footscray Warp and Port Phillip Bay, but on the floor of the Bay there is evidence of cycles of erosion in the form of marine platforms and delta deposits that may possibly be correlated with the Maribyrnong River cycles.

The heights of the terraces above L.W.M. decrease as they are followed downstream from Dry Creek, but their heights above

Fig. 1. The Keilor Terrace, Keilor (in middle distance)

river level increase. In some places their surfaces have been modified by cultivation and operations for irrigation purposes. Where this has happened, exact levels of the original surface cannot be accurately determined. Paired terraces have been formed at several places (Fig. 1) such as Dry Creek, near Salt-water Creek, the Electric Transmission Line, below the Albion-Broadmeadows railway bridge, at Chinaman's Ford, and, as noted by Hills, at Maribyrnong (Ascot Vale Gap) and West Essendon. There are also a number of subsidiary terraces due to minor adjustments and alterations of the streams such as shifting meanders. One or more of the terraces have in some places been almost obliterated by erosion.

On the right bank of the river between Dry Creek and Keilor township, the Keilor Terrace is about a quarter of a mile wide, but its surface level has been disturbed by cultivation. The most extensive portion retaining its natural surface is near the Electric Transmission Line; it is here about 150 yards wide. The surface of the Keilor Terrace marks the level of the first, the highest, and the most extensive flood plain in the Maribyrnong Valley.

The level of the Braybrook Terrace at Dry Creek is 7 feet below the Keilor Terrace, but at Chinaman's Ford (Fig. 5) the difference in levels is 13 feet. The largest remnant, measuring about a mile north and south, and a third of a mile east and west, is situated at Braybrook; its surface level there is 58 feet above L.W.M.

The Maribyrnong Terrace continues below Ascot Vale Gap (Fig. 6) along the former course of the river east of Quarry Hill; in this locality it was a paired terrace about a third of a mile wide. Its surface upstream from the Footscray Warp is 32 feet above L.W.M., and adjoining it is another terrace 27 feet above L.W.M., a meander of the higher one. At Dry Creek, its surface is 18 feet below that of the Keilor Terrace, and at Chinaman's Ford 35 feet.

Evidence of Post Glacial Eustatic Adjustments on the Shores of Port Phillip Bay and the Yarra Delta

The evidence of the post glacial 15-20 feet eustatic fall of sea level found at so many places on the Australian coast is preserved at a number of points on the shores of Port Phillip Bay. It will suffice to mention two that have been examined in some detail: one at Hampton, east of the Yarra Delta, by Hart (1893), and the other at Altona, west of the delta, by Hills (1940).

At Hampton the wave platform (Fig. 7) which appears to have been formed on a raised beach is 23 feet above L.W.M., but there is evidence of a small amount of tectonic uplift since it was

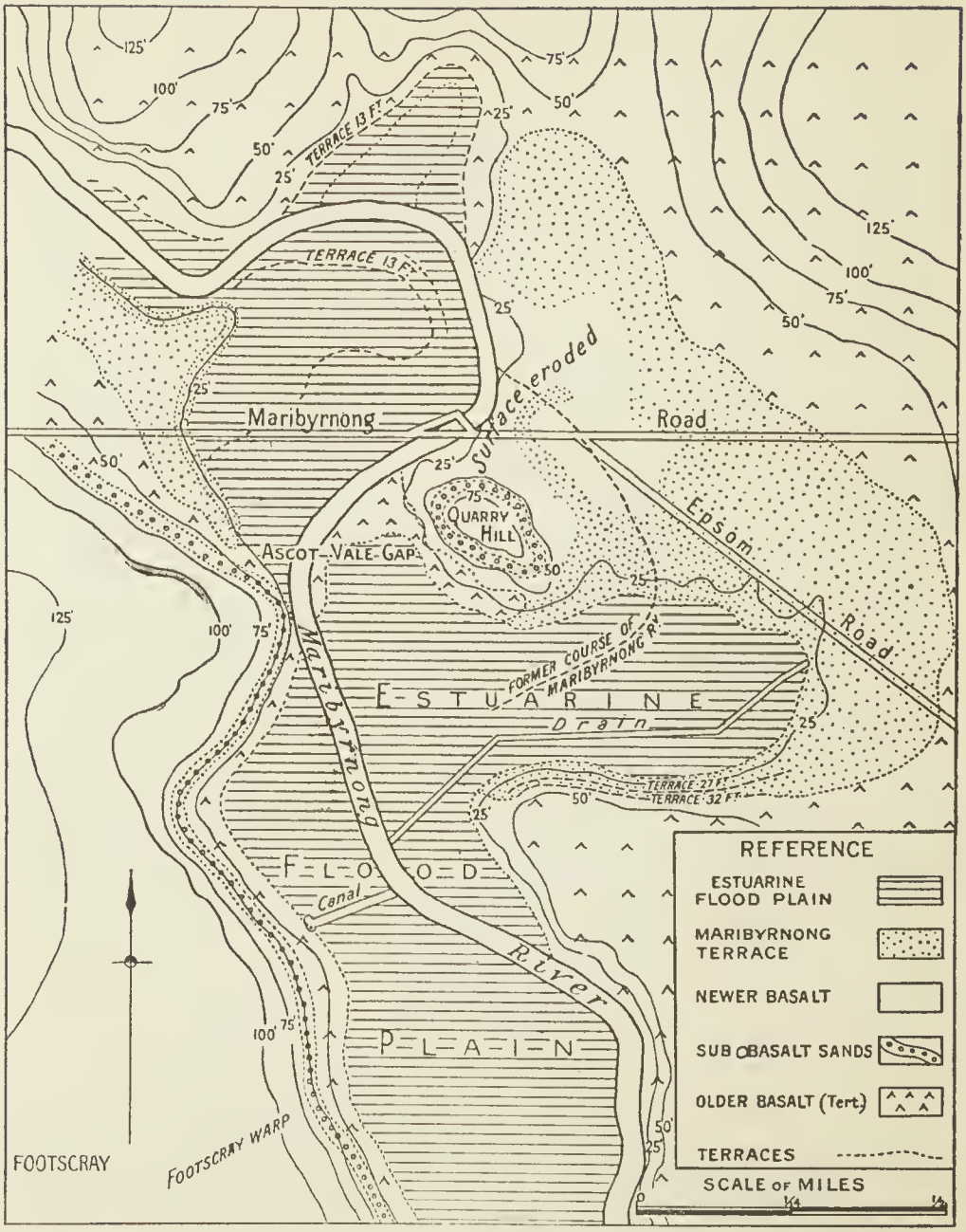

FIG. 6.

Map of the Area surrounding Ascot Vale Gap and the Estuarine Flood Plain showing the Maribyrnong Terrace, the 13 feet Platform, Footscray Warp and other Features.

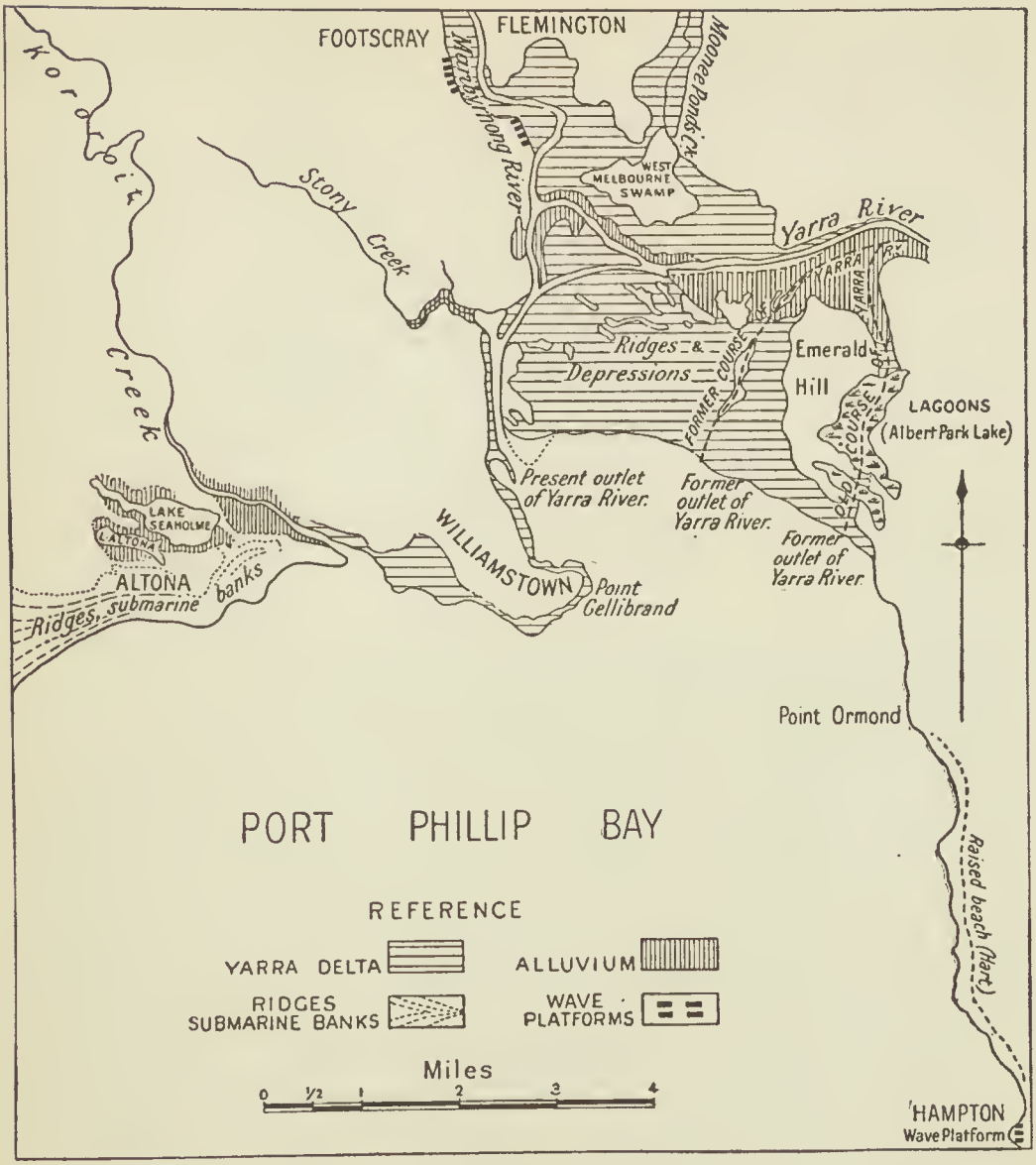

FIG. 7.
Map showing Yarra Delta, Wave Platform at Hampton, and Banks formerly submerged at Altona.

formed. It is covered with comminuted shells, mainly mussels, which may belong to the period of eustatic rise of sea level, or, as some maintain, to human agency, the platform showing evidence of having been the site of an aboriginal kitchen midden. Thirty or more species of mollusca, some marine worms, and a coral—all littoral species—are definitely associated with the formation of the raised beach.

The raised beach is plastered on the eroded scarp left by the subsidence of the Port Phillip Sunkland which assumed its present configuration at the close of the Pleistocene: the age of the raised beach and the wave platform is Recent.

The Altona shell beds (Fig. 7) rest on Newer Basalt—the southerly extension of the Keilor Plains lava field. Hills (1940) points out that they are well bedded, and there is no evidence of current bedding: the bivalves are thin-shelled and well preserved, the majority lying with their convex surfaces uppermost, indicating that they were deposited below high water mark out of the reach of the turbulent swash of the waves breaking on the beach. The ridges are 8 feet high, are relatively low and broad, and there is a succession of them. He states:

"that the underlying form of some at least of the ridges is that of submarine banks formed when the level of the sea was sufficiently high to cause it to flood over the basalt plains in the areas where the above-described ridges occur. It appears probable that, either at this time or as the sea retreated, these banks were added to in places by the growth of beach ridges, but the shell beds near the Williamstown Racecourse, and the lobate ridges near Altona, are regarded simply as upraised submarine banks."

There is general agreement that the shells are Recent. Of the nature of the emergence he remarks:

"Evidence of Recent emergence is so common along the Victorian coast, . . . that a eustatic fall of sea level may be suspected of having contributed to it. Such Recent emergence has been described by others, or has been observed by the author at Marlo, the Ninety-Mile Beach, Waratah Bay, Cape Patterson, Port Phillip, Apollo Bay, Warrnambool and Portland."

If some of the ridges of the Altona area are submarine banks formed when the level of the sea was higher, there is no doubt that the Yarra Delta was similarly inundated. As most of the Delta has been modified by human agency, we are compelled to rely on old records and maps. The maps show many features like those of the Altona area—an orderly succession of spaced depressions and, inferentially, ridges, trending west-north-west behind the north shore of Port Phillip Bay. In the West Melbourne Swamp littoral and estuarine shells have been found similar to those in the shallow ephemeral lakes of Altona.

The West Melbourne Swamp (Fig. 7) was an open sheet of water between the Maribyrnong River and Moonee Ponds Creek; in latter years it has been drained and reclaimed. It was formed by the lower reaches of the Moonee Ponds Creek being dammed back by sands deposited before the 15 to 20 feet eustatic fall of sea level, and was therefore flooded when sea level rose. There are records of fossil mollusca in the Swamp—all littoral or estuarine forms at present living in Port Phillip Bay. There are also

records of fishes, but without details as to what part of the Swamp they came from. One was a tooth of the White Shark, *Carcharodon carcharias* Lin.; another, the caudal spine of the Blue Spotted Ray, *Myliobatis australis* MacLeay. The skull of a dolphin is stated to have come from a depth of 10 feet, and was obviously deposited before the eustatic rise. The White Shark and the Ray imply some depth of water, and we are reliably informed that the White Shark does not frequent brackish or fresh water.

In the National Museum collection there is a gasteropod described thus: "*Marcia nitida* (Q. & G.) Pleistocene (Raised Beach) Saltwater River, Ascot Vale. Presented by Thomas Keys 17.4.06. No. 7616." We have been unable to locate the part of Ascot Vale from which the specimen came, but the inference is that it was one of several presented at the same time by Keys from sewerage excavations in Epsom Road (Fig. 6). If so, the site is south-east of Quarry Hill and the east side of the Estuarine Flood Plain.

Again, in regard to wave platforms round the Yarra Delta, we are dealing with an area that has undergone almost complete transformation since it was settled, but we are fortunate in having, at one locality at least, a reliable railway section made as far back as 1854. The section shows two platforms on the western fringe of the Delta, at the foot of the slope leading up from it to the Newer Basalt plain on which the city of Footscray is situated. The Delta here is approximately 1,500 yards wide and its surface about 5 feet above L.W.M. The shoulders of the platforms are masked by talus, but, allowing for this, their estimated levels are 9 feet and 13 feet above L.W.M. No platforms are evident on the opposite eastern fringe, but the grades of its slope alter at elevations corresponding approximately to the platforms on the western fringe. Less than a mile upstream, the 13 ft. platform is repeated in the same position as regards the fringe of the Delta. The fact that in both occurrences the platforms are at the same elevation negatives the possibility that they are the downstream extensions of the Maribyrnong Terrace, which would imply a fall for that flood plain of 19 feet to the mile. There is evidence of a 13 ft. terrace a short distance upstream from the head of the Estuarine Flood Plain (Fig. 6) and of a 10 ft. platform on the Flemington Racecourse.

We are unable to visualise the formation of terraces such as these by entrenching following tectonic uplifts of which there is no evidence in the Yarra Delta. Had there been uplift, the channel of the Maribyrnong River would have been lowered,

and terraces formed in the delta deposits on the slopes of the entrenched portion. They appear to have been wave platforms formed during eustatic lowering of sea level.

Correlation of the Maribyrnong River Terraces

It is submitted that the Keilor Plains lava field on which the Keilor, Braybrook, and Maribyrnong Flood Plains were formed is of Pleistocene age, presumably Middle Pleistocene. The Keilor, Braybrook, and Maribyrnong Cycles occured in connected sequence during the time interval between the formation of the Keilor Plains lava field and postglacial 15-20 feet eustatic fall of sea level. By tieing them up with the 15-20 feet fall of sea level, and placing the physiographical events that preceded it in logical sequence, the three cycles seemingly fall into the Upper Pleistocene, and correspond to the period when the Upper Pleistocene glacial and interglacial stages occurred in Europe.

In attributing the deposition of the flood plains and their subsequent terracing to eustatic adjustment, we desire to emphasize the fact that there is no evidence of Pleistocene or Recent glaciation in Victoria. The absence of systematic investigations as to the migration and extinction of the marsupials and the difficulty of defining cultures and industries in connection with the Australian aborigines, make it impossible to apply European methods in subdividing the Australian Pleistocene. We have relied on the world-wide eustatic adjustments associated with the glacial and interglacial periods of the Northern Hemisphere, and correlated our terraces with them. The contemporaneity of the Tasmanian and European stages is probable, but has not been definitely established. It is submitted that, if the Maribyrnong valley terraces are not strictly correlative with the European stages, the fact that we have tied them up with the Recent 15-20 feet fall of sea level, and shown that they preceded it in orderly sequence, proves that their age cannot greatly differ from that of those stages.

In regard to regional tectonic movements, it has been pointed out that the Keilor Plains lava field has been tilted seawards, but the tilting has retarded rather than assisted entrenchment. Its effect has been to make the eustatic falls appear less than they actually were. The greatest amount of entrenchment appears to be less than 40 feet. The streams of each of the cycles debouched into an almost completely enclosed bay situated on what is now the Port Phillip Sunkland or Port Phillip Bay. On the floor of the latter there is evidence of deltas and other estuarine land

forms, which may ultimately be correlated with the Maribyrnong River Valley cycles. The only localized warping that seems to have assisted erosion is the Footscray Warp, which occurred during the Maribyrnong Cycle, and therefore late in the physiographical sequence; its effect has been insignificant. No fracture lines are known to have occurred on the lava field.

TABULAR VIEW OF CORRELATION

Age	Maribyrnong Valley Flood Plains and Terraces	Glacial & Interglacial Stages
Recent	Vertical erosion due to latest fall of sea level at present in progress above tide limit in Maribyrnong valley. Rise of sea level. Raised beaches, submarine banks, wave platforms.	Postglacial
Upper Pleistocene	Eustatic fall of sea level and Footscray Warp. Entrenchment of Maribyrnong Flood Plain and formation of Maribyrnong Terrace	Wurm 3
	Eustatic rise of sea level. Formation of Maribyrnong Flood Plain	W2/3 Interglacial
	Eustatic fall of sea level. Entrenchment of Braybrook Flood Plain and formation of Braybrook Terrace	Wurm 2
	Eustatic rise of sea level. Formation of Braybrook Flood Plain	W1/2 Interglacial
	Eustatic fall of sea level. Entrenchment of Keilor Flood Plain and formation of Keilor Terrace Formation of Keilor Flood Plain.	Wurm 1
Middle Pleistocene	Vertical erosion of Keilor Cycle. Keilor Plains Basalt (Newer Basalt).	Riss-Wurm Interglacial

ACKNOWLEDGMENTS

We desire to acknowledge our indebtedness to Mr. John Knight, B.Sc., of the State Coal Mine, Wonthaggi, and Mrs. S. Whincup, M.Sc.; they both entered wholeheartedly into the task of levelling and correlating the terraces in the Maribyrnong valley.

To Mr. I. W. Scott, of the Ways and Works Branch of the Victorian Railways, we also express our thanks for checking our Dry Creek datum by an accurate traverse from a Country Roads Board datum.

The plans were drawn by the Geological Survey of Victoria.

References

Adam, W., 1943. The Keilor Fossil Skull: Palate and Upper Dental Arch. Mem. Nat. Mus. Vict., 13, pp. 71-77.

Aplin, C. D. H., 1858 (*circa*). Quarter Sheet I.N.W. Geol. Surv. Vict.

Crespin, I., 1926. The Geology of Green Gully, Keilor, with Special Reference to the Fossiliferous Beds. Proc. Roy. Soc. Vict., 38 (n.s.), pp. 100-124, pls. 3, figs. 2.

Grayson, H. J., and Mahony, D. J., 1910. The Geology of the Camperdown and the Mount Elephant Districts. Geol. Surv. Vict., Mem. 9.

Hart, T. S., 1893. Notes on the Rocks of Brighton and Moorabbin and the Surrounding Districts. Vict. Nat., IX (10), pp. 156-159.

Hills, E. S., 1938. The Age and Physiographic Relationships of the Cainozoic Volcanic Rocks of Victoria. Proc. Roy. Soc. Vict., 51 (n.s.), pt. 1, pp. 112-139, figs. 4.

1940. The Question of the Recent Emergence of the Shores of Port Phillip Bay, *ibid.*, 52 (n.s.), pt. 1, pp. 84-105, plates 2, figs. 3.

1940. The Physiography of Victoria. 8vo, Melb. and Syd.

Mahony, D. J., 1943. The Keilor Fossil Skull: Geological Evidence of Antiquity. Mem. Nat. Mus. Vict., 13, pp. 79-81.

Officer, G., 1893. Excursion to Keilor. Vict. Nat., X (2), pp. 21-22.

Singleton, F.A., 1941. The Tertiary Geology of Australia. Proc. Roy. Soc. Vict., 53 (n.s.), pt. 1, pp. 1-125, pls. 3, figs. 15.

Wunderly, J., 1943. The Keilor Fossil Skull: Anatomical Description. Mem. Nat. Mus. Vict., 13, pp. 57-63.

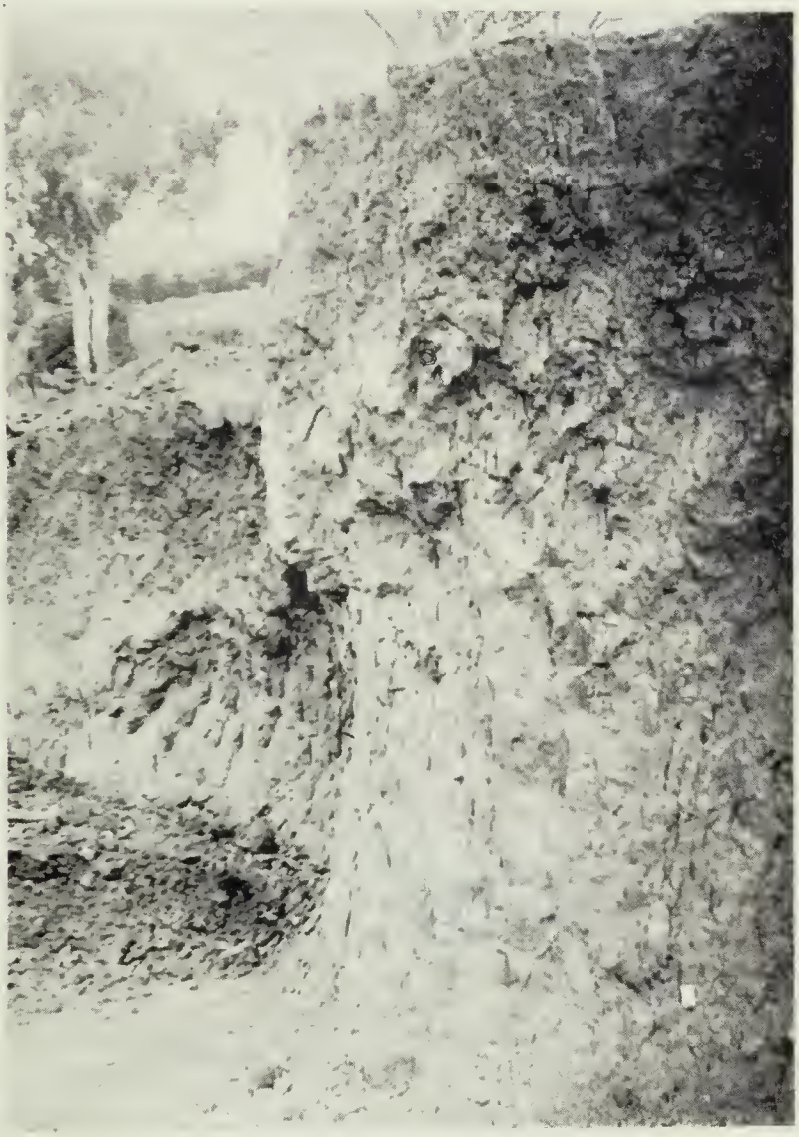

Fig. 2. Hughes's Sand-pit. Matchbox in right-hand lower corner marks the place where the Keilor skull was found.