

R. M. JOHNSTON MEMORIAL LECTURE.

GEOLOGICAL EVIDENCE OF THE ANTIQUITY OF
MAN IN THE COMMONWEALTH, WITH SPECIAL
REFERENCE TO THE TASMANIAN ABORIGINES.

By

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PART I.

BRIEF SUMMARY OF THE LIFE AND CHARACTER
OF R. M. JOHNSTON.

The great honour and privilege has been conferred upon me by the Fellows of the Royal Society of Tasmania of inviting me to deliver the first of the Memorial Lectures to a truly great man, one who always gave of his best, and whose whole life was one of loving and faithful service, the late Robert Mackenzie Johnston. From my heart I thank you for this privilege.

Already a grateful country has published a fine work in "The R. M. Johnston Memorial Volume," embodying his chief papers and pamphlets and giving a summary of his biography, with a foreword from one who perhaps knew him best, the Hon. Sir Elliott Lewis. The Royal Society of Tasmania in its volume for 1918 has also given a short biography and a complete list of his published papers. Under these circumstances, I do not propose to more than very briefly touch upon his life work, but will review briefly some recent geological researches inspired largely and to a great extent built on the foundation which Johnston so well and truly laid.

Though one shrinks from treading on such holy ground as that of the life of a vanished friend, one is nevertheless drawn to do so by the strength of one's love for him, for in the simple phrase of the country of his birth, he was "a lovely man."

Born in 1845 at a little fishing village in the Black Isle, on the shore of the Moray Firth in Scotland, he died in Hobart in 1918 at the age of 73 years. His father had a small croft, on which he owned a humble cottage.

Young Johnston was educated at the village school, and derived much inspiration from the works of the famous stone-mason geologist, Hugh Miller, who lived in the neighbouring town of Cromarty. His early taste for geology may be traced to this source. He left school very young, and for two years was herd laddie and harvest hand on a neighbouring farm. In spite of hard work he found time for some reading, and the ambition grew strong within him to see something of the great world. When only a laddie of 14 years of age he showed the great strength of his character in breaking from all his surroundings. In the long

run this break brought him to Hobart. It is a pathetic story. One is tempted here to parody Kipling:—

“How far is Hobart City from a Scottish lad at play!
What makes you want to wander there with all the
world between?”

Oh mother, call your son again, or else he'll run away.” But young Robert had no mother to call him back. She had died some years before, and so he ran away. How terrible must have been the mental strain and struggle for one so young and so strongly swayed by his affections to break away from his father and sister, and seek his fortunes in the great world beyond his ken!

By the sweat of his brow he earned his daily bread at Edinburgh, but still found time to read. He read poetry, science, fiction, and philosophy. Later he left Edinburgh to do manual work on a railway in the North of Scotland, interesting himself in the geological structure of the country as revealed in the cuttings. His good work won him the position of a ticket clerk, and later he became clerk at a Railway Goods Department, Glasgow. In 1870, at 25 years of age, he once more showed his enterprise, ambition, and tenacity of purpose by selling all his books, and most other belongings, and emigrating to Victoria. He was engaged as a clerk at Colac. While here, when the first railway line in Tasmania—that from Launceston to Deloraine—had been opened, he received the appointment of clerk in charge of the accountant's department, and soon afterwards was promoted to chief clerk in the Auditor-General's Office. In 1881 he was appointed to the newly-created office of Government Statistician and Registrar-General for Tasmania, a position which he held for 37 years until the time of his death.

Others can speak with authority on the great value of his numerous annual volumes of Tasmanian statistics, of the very important work he accomplished in unifying methods of presenting statistics, methods followed later by statisticians in various parts of Australia, on his contributions to economic questions relating to Labour and Capital, to the framing of the *per capita* scheme for the equitable distribution among the States of the Commonwealth (that was being initiated) of the surplus revenues derived from the collection of Customs and excise duties, and the successful advocacy of proportional representation. One who can speak with authority has already spoken of this already in terms of high praise that carry weight, Sir Elliott Lewis, and *laudari a laudatis viris summa laus*.

The above was his chief life work. It is specially his hobbies that claim the attention of his brother scientists.

When at Launceston he became the friend of Mr. Gunn after whom not a few Tasmanian plants have been named, and from him derived a taste for botany. Later he contributed five papers on the flora of Tasmania.

His extraordinary versatility and energy are shown by the fact that he also contributed eight papers on mollusca, sixteen upon fishes, and no less than 56 papers on geological subjects.

He was Royal Commissioner on Fisheries, and I am informed by no less an authority than Mr. C. Hedley, F.L.S., of the Australian Museum, Sydney, that Johnston's work on the fishes was of great value, and, particularly in view of the many limitations in those early days, was most meritorious. The great work which he published in 1888, "The Geology of Tasmania," with an account of the minerals and rocks of Tasmania, has laid a splendid foundation on which future generations may build, and his geological map of Tasmania is a masterpiece. There is, of course, much to be added to it, but little to alter in the main features. But in profiting by the wealth of information in his classic books and papers, one must not lose sight of the tremendous physical effort, hardship, and privation which he, with his stalwart comrades, endured in their quest of the unknown, a quest fraught with difficulties which might well have appalled all but the bravest of the brave. We know that in 1874, in company with the late J. A. Scott, W. C. Piquenit, Lieutenant Burgess, and two others, R. M. Johnston spent six weeks (all of the party laden with knapsacks weighing from 60 to 70lb.) in exploring the whole of the south-western highlands lying between the mouth of the Huon and Macquarie Harbour, and in making collections and observations on the geology and botany of that region.

In 1879 he formed one of a similar party in exploring the northern region of the western highlands, including Gad's Hill, Middlesex Plains, Vale of Belvoir, Valentine's Peak, Mount Bischoff, the headwaters of the Mackintosh Valley, and other tributaries of the Pieman and Arthur Rivers.

Next, in the year 1887, in company with his friend, the late C. P. Sprent, Deputy Surveyor-General, and five others, he traversed on foot and examined the whole of the region lying near to the route across the island by way of the

Ouse, Bronte, Lake St. Clair, Mount King, William I., Mount Arrowsmith, Coilingwood Valley, King River, Mount Lyell, Queen River, and Macquarie Harbour, thence northward across the Henty, Mount Heemskirk, Corinna, Whyte and Heazlewood Rivers, Magnet Range, and Mount Bischoff, to Emu Bay on the North-West Coast. Only those who have experienced them can realise what terrible barriers to progress are the native scrubs, the "horizontal," the *Bauera*, and the myrtle scrubs, not to mention the dense masses of fern, rotten sassafras, logs, etc., and the swiftly rushing and swollen streams to be crossed, by the slow and tedious process of felling trees to span the rivers. All this would be most trying to the most vigorous and unencumbered of men, but how Johnston and his colleagues and their hardy predecessors, wet, cold, weary, and half famished, fought their way through these almost insurmountable obstacles, each with his 60 to 70 lb. weight of pack, involved efforts almost superhuman.

We who have entered into their labours and follow now so easily and swiftly in train or car where they so slowly and painfully, but so surely, blazed the trail, must not forget the hardy heroic pioneers who marched ahead of the army of occupation. Who were these heroes? Men such as he who was such an early inspiration to science in this country, the heroic sailor soul, Sir John Franklin, and it should not be forgotten that in his desperate march through scrub and jungle to Port Davey Lady Franklin went with him and shared his hardships; men such as Charles Gould, C. P. Sprent, J. A. Scott, W. C. Piquenit, Lieutenant Burgess, and many another, and last, and not least, the man we tonight specially delight to honour, R. M. Johnston.

And while we honour these leaders among men, let us not forget the pioneer work of the rank and file, that goodly fellowship of prospectors and pathfinders, many of whom perished lonely and unsung. Surely not the least honour is due to the memory of these unknown warriors.

The spirit of these men lives yet, in young explorers of Tasmania to-day, as testified by the recent fine journeys made under the leadership of Major L. F. Giblin and A. V. Giblin, which have led to the conquest of Mount Anne. As one who may be permitted to claim to have attempted some pioneering work in another field, I would offer here a humble and heartfelt tribute to the pioneers of Tasmania, and foremost among them to my old comrade, R. M. Johnston.

PART II.

GEOLOGICAL EVIDENCE OF THE ANTIQUITY OF
MAN IN THE COMMONWEALTH, WITH SPECIAL
REFERENCE TO THE TASMANIAN ABORIGINES.

One now passes to notes on the special research "Evidence of the Antiquity of Man in the Commonwealth, with special reference to the Tasmanian aborigines."

This subject would not seem inappropriate to this memorial lecture, as Johnston was no mean authority on the Tasmanian aborigines and their implements, and, moreover, their ancient history, as will presently appear, was intimately linked up with phases of the great ice age through which Tasmania has passed many thousands of years ago, and evidence of the former presence of glaciers and ice sheets in Tasmania was a favourite subject of research for R. M. Johnston. One of his chief scientific papers is wholly devoted to this subject.

Before proceeding to consider the age of the first coming of man into Tasmania and Australia, we must briefly review some time scale, to which we can refer the evidence, a scale which has been made after much toil of many workers in the Northern Hemisphere.

This scale depends on phases of what is known as the Pleistocene Ice age. It is now generally recognised that there were four glaciations, separated from one another by three mild inter-glacial phases.

1. TIME SCALE SUPPLIED BY PLEISTOCENE GLACIAL EPOCHS.

a. In the Northern Hemisphere. (24)

These four glacial phases, with their inter-glacial phases, were approximately as follows:—

Post-glacial Time, about 7,000 years, that is, about 5,000 B.C., to present

Würm or Wisconsin Ice Age, 5,000 B.C. to 15,000 B.C. (possibly 50,000 B.C.).

Dürntenian or Sangamon, mild epoch, 15,000 B.C. to 60,000 B.C.

Riss or Illinoian Glaciation, 60,000 B.C. to 80,000 B.C. (possibly 150,000 to 180,000 B.C.).

Helvetian, or Yarmouth, or Tyrolian, mild epoch, 80,000 B.C. to 250,000 B.C. (possibly 180,000 to 350,000 B.C.).

The Mindel or Kansan Glaciation, 250,000 B.C. to 280,000 B.C. (possibly 360,000 to 400,000 B.C.).

Norfolkian, Aftonian, or Cromer, mild epoch, 280,000 B.C. to 350,000 B.C. (possibly 400,000 to 470,000 B.C.).

Günz Glaciation, 350,000 B.C. to 380,000 B.C. (possibly 470,000 to 500,000 B.C.).

The estimates for the last mentioned phases of glaciation, such as the Günz and the Mindel, are necessarily only very approximate. The age of the Günz glaciation, for example, may have been as far back as fully 500,000 years ago.

b. In Tasmania.

In Tasmania there have been many workers who have recorded evidences of the great Pleistocene glaciation of this island, notably R. M. Johnston, C. Gould, C. P. Sprent, T. B. Moore, M. E. J. Dunn, A. Montgomery, Graham Officer, Lewis Balfour, E. G. Hogg, W. H. Twelvetrees, L. K. Ward, Professor J. W. Gregory, Dr. F. Noetling, Dr. W. N. Benson, Professor T. Griffith Taylor, Dr. Loftus Hills, Mr. Mackintosh Reid, and Mr. Arndell Lewis. Professor J. W. Gregory has also given a special account of the area near Queenstown and Mount Lyell, Q.J.G.S. He concludes that the glacier ice in the Linda Valley, near Gormanston, and near Queenstown, came down to within about 900 to 1,100 feet of sea level. Professor W. N. Benson has described in detail the Cradle Mountain area, and concludes his valuable paper with a full bibliography of Tasmanian Pleistocene glacial literature. (1) Professor Griffith Taylor and Mr. Arndell Lewis agree that there are evidences of at least two, if not three, glacial invasions of Tasmania during Pleistocene times. The earliest apparent one "was by far the most considerable, "and was followed by two later phases." This earlier glaciation developed an ice sheet, which actually came down to sea level at Port Davey, extended to below 1,000 feet above sea level, in the neighbourhood of Gormanston and Queenstown, and came down to within 100 feet or less of sea level between the mouth of the Henty River and the Eden Valley. Recent observations by Dr. Loftus Hills and the writer have fully confirmed Mr. T. B. Moore's statement as to the downward limit of the Pleistocene ice sheets, when at their maximum development, in that part of Tasmania. So extensive was this glaciation that fully a third of Tasmania was under a more or less continuous ice sheet, with points like Barn

Bluff, Cradle Mountain, Mt. Pelion, etc., showing as nunataks. "Outwash apron gravels" deposited by the thaw waters of surface or subglacial streams now cover low-lying strips around Macquarie Harbour, and thence northwards to beyond the mouth of the Henty River. These outwash gravels are separated from one another by deposits of peaty sand and peat. They have previously been described as raised beaches, but the writer would point out that while there is evidence there, as in most parts of Tasmania and Australia, of a raised beach up to 15 feet above high water, accompanied by the presence of marine shells, no trace of post-Tertiary marine shells, as far as the writer is aware, has ever been found in Tasmania at a higher altitude than about 15 feet above high water. The great shingle terraces, on the other hand, in the neighbourhood of Kelly's Basin, Macquarie Harbour, and to the east of Strahan, attain altitudes of from 200 up to over 240 feet above sea level. Close to Strahan railway station the following section was measured by the writer at the lowest terrace there:—

1ft. 3in.	Peaty sand.
6in. to 9in.	Loose grey sand.
2ft. 0in.	Peaty sand. A few pebbles near the top.
2ft. 0in.	Shingle with pebbles mostly 3 to 4 inches in diameter, resting on an eroded surface of peaty shale.
3ft. 0in.	Laminated hard peaty shale, emitting a slightly woody ring when struck.
33ft. 6in.	Mostly coarse shingle, pebbles from 1 inch up to 1 foot in diameter, oval and well rolled. In the lowest 5 to 6 feet of this bed there are numerous disrupted fragments of carbonaceous shale, belonging apparently to slightly older post-Tertiary or late Tertiary formation. These disrupted fragments are on a line of strong erosion.
18ft. 0in.	Sandy clay, carbonaceous, passing almost into peat in places, but the top 5 feet is mostly sandy, weathering yellowish grey. This extends down to sea level.
<hr/>	
Total 60ft. 3in.	

There are many hundreds of feet in thickness of soft sandstones and clays below the lowest bed of shingle, but they appear to be pre-glacial.

Mr. Arndell Lewis would ascribe such outwash gravels to the maximum Pleistocene ice-sheet of approximately Riss or Mindel age. Mr. Arndell Lewis appears tentatively to hold the view that the lowest evidence of glaciation in the Broad River Valley at National Park is of about the same age as the outwash gravels of Strahan. Such glaciation at National Park would be approximately at its lower limit about 2,000 feet above sea level, possibly as high as 2,400 feet.

Recently Dr. Loftus Hills has observed evidences of glaciation at Mount Victoria, between St. Helens and Scottsdale, at an altitude of about from 3,964 feet (which is given as the altitude of the summit) for several hundreds of feet downwards.

The question of Pleistocene glaciation and its age in this north-east part of Tasmania is of special importance in regard to a very important piece of evidence about to be detailed presently, by far the oldest as yet recorded on the subject of the antiquity of aboriginal man in Tasmania.

In this part of the island there are widespread sheets of shingle and gravel, with peaty beds intercalated, which have been worked extensively for stream tin between Herrick and Boobyalla. At the Pioneer Mine, to the north of Herrick, these strata attain a thickness of at least 80 feet; they are up to 68 feet in thickness at the Scotia Mine, one mile to the north-west of Gladstone. At the old Doone Mine, about a mile west of the Scotia, the drift was about 15 to 25 feet thick. The drift apparently dips below sea level towards the coast below Boobyalla. It appears to the writer that this old peaty granite sand drift, which the late W. H. Twelvetrees suggested tentatively (35) was raised beach material, is in reality, in view of later evidence now available, outwash apron material, analogous to that of Strahan. In this case it would have been formed by the thaw waters of the last great ice sheet, at newest the Würm ice sheet, dating back to about 17,000 years ago. If this supposition is correct, the deposit would have been laid down by extensive floods coming from the head of the Ringarooma Valley and its numerous tributaries, at a time when Mount Victoria was under ice and the lower spurs of the adjacent ranges supported extensive névé fields.

An attempt has been made in the table given in the summary of this paper on pages 130, 131, to supply a provisional scheme to show the probable approximate relative ages of the evidences of the presence of early man in Tasmania and Australia. This table is very tentative, and the dates, of course, very approximately assigned, may be much in error, but it is believed, nevertheless, that they are a reasonable approximation. We may now proceed to consider the details with regard to the antiquity of man within the Commonwealth, commencing with Tasmania, and then passing on to Australia. No attempt is made to put forward any case for man having a geological antiquity in New Guinea. Evidence, in the writer's opinion, will be forthcoming later to prove that his first coming into New Guinea dates a long way back into the past.

2. EVIDENCE OF THE ANTIQUITY OF MAN.

A. In Tasmania.

- i. Geological and Geographical.
 - a. Occurrence of aboriginal chaledonic flake in fluvio-glacial (?) compact drift at the Doone Mine, near Gladstone, North-East Tasmania.
 - b. Occurrence of aboriginal chipped pebbles and stone cores at Regatta Point, on right bank of Tamar River, one mile north of Launceston. Numerous specimens of this type were found by the writer last February in the consolidated shingle of a slightly raised beach (3-4 feet above high water).
 - c. Occurrence of very numerous aboriginal cherty flakes and other implements in what appears to be an old natural shore-line of the so-called Lake Leake, now an artificial reservoir, 15 miles east of Campbell Town.
- ii. Antiquity deduced from distribution of implements.
 - a. Wide area over which stone implements are found in Tasmania, and the vast number of such implements.
 - b. The thickness and extent of the aboriginal kitchen middens.
- iii. Cultural evidence.
 - a. Paleolithic or Eolithic stage of culture of the Tasmanian aborigines.

- b. Ignorance of making sea-going canoes. This implies that they must have crossed the Bass Strait area at a time when Tasmania was a peninsula of Australia.
- iv. Anatomical evidence.
- a. Alliance of Tasmanians to the primitive negrito races.
 - b. Archaic type of their dentition.
 - c. The Tasmanian a true *homo*, and probably newer than *Pithecanthropus* of Bengawan, Java, or *Eoanthropus dawsoni*, of Piltdown, Sussex.
 - d. Tasmanian aboriginal, though for long an inhabitant of a cool temperate climate like Tasmania, does not exhibit any tendency towards a whitening of his skin, which appears to have maintained throughout its original blackness.
- v. Associated fauna.
- a. In this respect the entire absence of the dingo from any human remains in Tasmania corroborates the evidence suggested by the Tasmanian aboriginals' ignorance of the art of making sea-going canoes, that he arrived in Tasmania by a land bridge before the dingo was imported into Australia by the early Australian aboriginal.
 - b. Evidence is not yet to hand that the Tasmanian aboriginal was contemporaneous with extinct animals such as the marsupial rhinoceros (*Nototherium mitchelli*, *N. tasmanicum*, etc.), and yet the peaty deposits of Mowbray Swamp, near Smithton, appear to belong to an age at least as new as the stream tin deposits of the Gladstone district, in which a human-worked flake has been found. Moreover, Messrs. H. H. Scott and Clive E. Lord describe the femur of the calf of a *Nototherium* from the above swamp which has been damaged by some sharp-cutting tooth or instrument, possibly either the carnassial tooth of a *Thylacoleo* or an aboriginal hache. (20)

We may now review these evidences in detail. In regard to i.a., the late Mr. W. H. Twelvetrees has described this occurrence (Roy. Soc. Tas. Papers and Proceedings,

1916, pp. 48-50, pl. 5). The flake is formed of chalcedony, which, after being struck off by a single blow, has been dressed on one side and retouched later on the same side so as to give a number of small saw-like teeth to the cutting edge, which was evidently used for smoothing down or sharpening spears. Mr. W. H. Twelvetrees submitted the flake, just after its discovery, to the late Mr. R. M. Johnston, who had an exceptionally wide experience in the matter of Tasmanian stone implements. Mr. Johnston was absolutely convinced at once, as indeed anyone must be with any knowledge of the subject, that the flake was of human workmanship. This flake is illustrated on Plate VIII.

It was found at the old Doone Mine, about three miles north-westerly from Gladstone, and under an overburden of about 10 feet of very firmly compacted drift. This drift was formed of granite sand, with a certain amount of interstitial clayey peat. Mr. Twelvetrees was of opinion that the whole deposit was of marine origin. In view of later sections and discoveries, the writer cannot entertain this view, and holds, as the result of a personal examination of the scene of the discovery, and of similar deposits in other parts of Tasmania, that the deposit is to be correlated, as regards origin, though younger in time, with the "out-wash" "apron" deposits of Strahan, on the west coast of Tasmania. These consist of gravel with peaty sands, peaty clays, and peat, and lie on the seaward side of the great terminal moraine between Eden and the Henty River, which marks the maximum advance of the old Pleistocene ice-sheet in Tasmania as far as present evidence goes. Certainly the deposit at Gladstone is very wide spread, and at the Pioneer Mine, a few miles to the south, it is over 80 feet in thickness. Obviously, since the deposit was laid down, the Ringarooma River had deepened its channel by at least 60 feet, as shown on the section, Pl. IX. The river did not occupy its present channel, in Mr. Twelvetrees' opinion (in which the writer concurs), at the time when the drift was deposited at the Doone Mine.

The flake was found by Messrs. Richards and Murray at the time when Mr. Richards was using the hydraulic nozzle to wash away the overburden from above the tin gravel. The latter is there about $2\frac{1}{2}$ to 4 feet thick. Mr. Richards had been requested by Mr. Twelvetrees, a day or two before, to be on the look out for possible traces of sea shells in the deposit. Richards's attention was attracted suddenly by the unusual object of this chipped flake, which

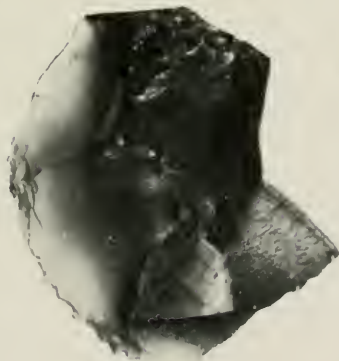


Fig. 1. Obverse (x 1½).

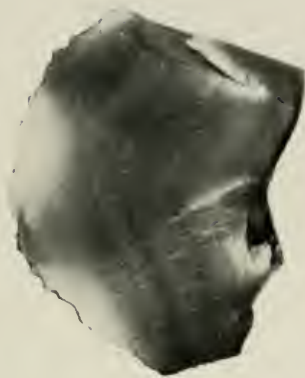


Fig. 2. Reverse (x 1½).

Figs. 1 and 2. Aboriginal chalcidonic flake, found *in situ* at 10ft. below the surface in consolidated fluvio-glacial (?) drift immediately overlying stream tin gravel, Doone Mine, 2½ miles N.W. of Gladstone, N.E. Tasmania.

he thought to be a shell, just exposed to view by the water jet. He immediately went forward, and picked it out of its matrix, to which it was slightly adherent. In doing so, a small piece fell off. This has not been preserved. He called to Mr. H. Harvey, the Government inspector of the Mount Cameron water race, who was close by in the mine at the time, and who informed the writer (last February) that, on hurrying to the spot, he carefully examined the site from which the flake had been picked by Mr. Richards, and distinctly recalled the fact that he noticed at the time of the discovery that there was a well marked impression in the old drift, into which the flake exactly fitted, and from which it had been lifted out by Mr. Richards.

Mr. Murray, a son of a late Government Geologist of Victoria, Reginald Murray, and a partner of Mr. Richards, quite confirms the account originally given by Mr. Richards to Mr. Twelvetrees, and also that now given by Mr. Harvey. They all agree that there is not the slightest possibility of the flake having fallen from above and having been driven by the water from the hydraulic nozzle into the compact drift. The extreme freshness of the chalcedony considered as a mineral specimen (that is, the remarkable absence of weathering) made the writer seriously consider at first the possibility of the flake having been artificially injected, in the manner indicated above, into the drift overlying the stream tin, but he is quite satisfied that some other explanation must be found for its extraordinarily fresh state of preservation. He thinks it is to be attributed to the interstitial peaty clay in the sand having stopped all water circulation and also prevented contact with the air, and so checked weathering. At the same time, the "retouching" on the edges of the flake suggests to him a more modern phase of artefact evolution than that indicated by the specimens about to be described, from a more recent deposit.

The following is a general section at the old Doone Mine southwards to the present channel of the Ringarooma River:—

	Surface level, about 100 feet above sea.
6in.	Peaty humus covered with grass
6in.	Grey sand.
6in.	Peaty sand.
4in.	Grey sand.
10in.	Hard ochreous sandy silt.

- 6ft 0in. Dark grey fine sandy silt, compact and dark grey, through peaty material. This rests on a slightly eroded surface.
- 4ft 0in. Gritty, pebbly sand rock; the aboriginal chalcedonic flake occurred in this layer, immediately overlying the stream tin gravel below.
- 8ft. to 12ft. 0in. in places thinning to 3ft. Gravelly consolidated drift, with stream tin and well rolled pebbles of quartz and slate from 1 inch to 3 inches in diameter, and sub-angular reef quartz up to 6 inches in diameter; pot-holes of shingle occur in places about 3 feet in depth. The lower part of this drift yields stream tin at the rate of from 1 to 1½lb. per cubic yard.

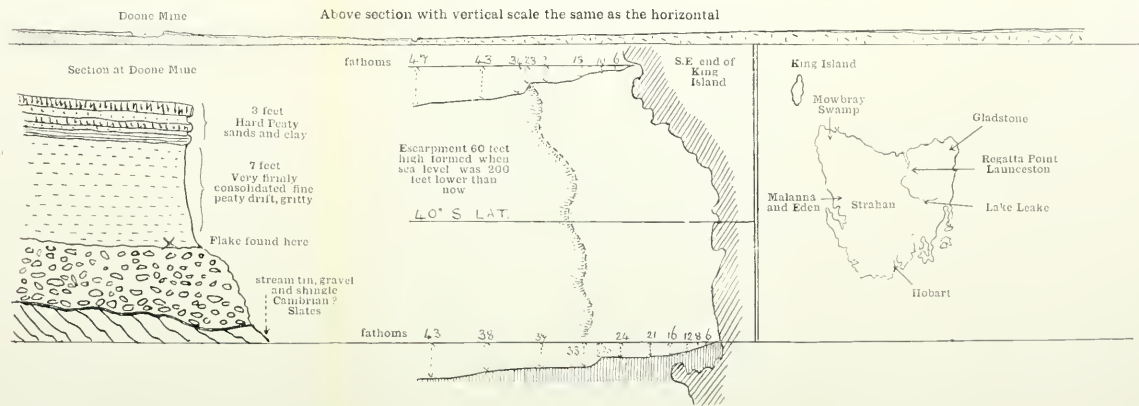
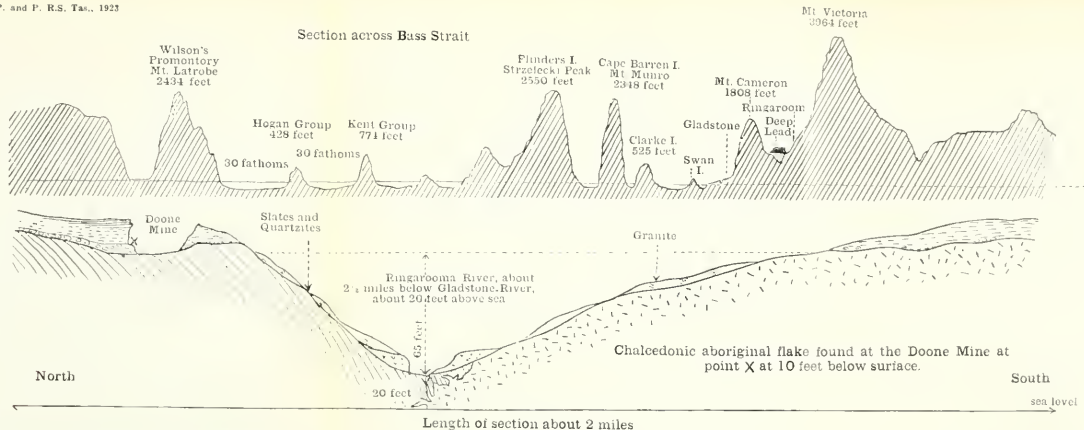
Floor under stream-tin drift fine-grained, greenish felspathic quartzite; dips W. 18 deg. S. at 18 deg. The age of these sedimentary rocks is assumed to be Cambro-Silurian.

The undulating, but on the whole flattish, floor, on which the drift reposes, is just about 65 feet above the Ringarooma River and 85 feet above sea-level.

At the time these wide-spread gravels and sands were being deposited, the Ringarooma River could not have occupied its present channel, which is about a quarter of a mile to the south, and which has subsequently been deepened in hard rock (partly felspathic quartzite, partly of granite) by about 65 feet. At the rate of erosion determined by C. C. Brittlebank for the Bacchus Marsh district of Victoria, such a work of erosion might have been done by a river like the Ringarooma in a period of time of the order of 100,000 years.

This would surely be older than the Würm glaciation, and would more nearly correspond with that of the Riss.

If, therefore, this flake was really *in situ*, as seems practically certain, it would put back the coming of man into Tasmania into perhaps the time of the Riss glaciation. At the same time, if the early part of the Würm glaciation dates back, as some think, to 50,000 years ago, the excavation of the present Ringarooma valley out of the



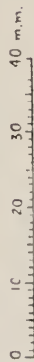


Fig. 1.

Fig. 1. Pebble of Pre-Cambrian quartzite chipped by Tasmanian Aborigines to form a scraper. From 3-4 ft. raised beach at Regatta Point, one mile north of Launceston.

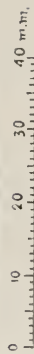


Fig. 2.

Fig. 2. Artefact formed of a pebble of sub-translucent greenish chalcidonic Pre-Cambrian quartzite, from 3-4 ft. raised beach, Regatta Point, Launceston. The artefact has been waterworn subsequent to being left on the beach.

ARTEFACTS ("TRONATTA") OF PRE-HISTORIC TASMANIAN ABORIGINES.

outwash apron material and the undulating peneplain of hard rock on which it reposes, may very well have taken place in post-Würmian time.

Meanwhile this is the most important discovery up to date, as to the high geological antiquity of man within the Commonwealth.

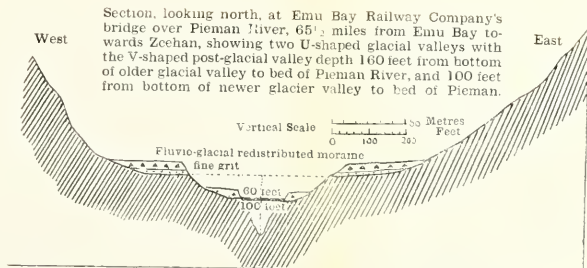
i.b. Last February the writer discovered at Regatta Point, one mile north of Launceston, on the east bank of the Tamar River, a large number (altogether about 100) of specimens of very roughly chipped implements formed out of pebbles embedded in the loosely cemented conglomerate of an old raised beach. So rudely fashioned were some of these implements that at first he doubted whether they were necessarily of human workmanship. The occurrence of these sharp-edged flaked stones alongside of well rolled shingle attracted attention as an anomaly in sedimentation requiring explanation. Eventually he discovered *in situ* a roughly chipped somewhat water-worn implement of sub-translucent chalcedonic quartzite, most obviously of human workmanship. At least 30 definite blows had been struck in order to fashion the implement into its present form. (See fig. 2 of Pl. X.) Unfortunately the original has been temporarily mislaid.

This raised beach is about 4-5 feet thick, and extends to at least 2-3 feet above high water spring tide, and is further covered by an overburden of about 8 feet of talus from the hill slope. The raised beach material is a ferruginous gravel, loosely cemented. The raised beach rests on Tertiary lacustrine leaf beds, perhaps of Miocene or Pliocene age. The raised beach belongs to the period, in the opinion of the writer, of a higher sea-stand, when sea level was perhaps 3-5 feet above what it is now. The maximum sea level of this epoch within the area of the Commonwealth averaged about 15 feet above present sea level, and dated back to a time suggested by R. A. Daly to be about 7,000 years ago. From this an age of perhaps 1,500 to 2,000 years may be deduced for this raised beach on the assumption that the decline in sea level took place at a uniform rate from 7,000 years ago down to the present time. The aborigines preferred a hard laminated pre-Cambrian quartzite for making their rough scrapers there. These were obtained from pebbles, in a gravel bed 8 feet thick and 85 to 110 feet above high water immediately above (to the east) the raised beach. A few scrapers are made

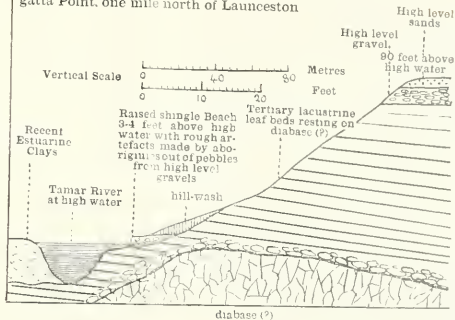
of diabase. These are rotted, through weathering, to a depth of from $1/16$ th to $1/10$ th of an inch. The writer thinks it would take over 1,000 years for diabase to weather to this extent. Many of the "cores" show discoloration due to the action of fire, which was evidently used to cause the pebbles to exfoliate in curved flakes.

More search in this area is much to be desired, as it might reveal an early stage in the evolution of the fashioning of stone implements by the Tasmanian aborigines. Only one implement formed of chert was found, among the 100 collected, at Regatta Point.

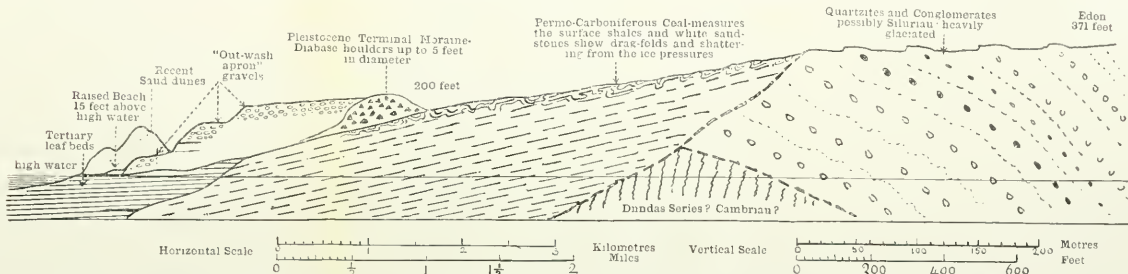
i.c. At Lake Leake last February the writer found over 100 specimens of stone implements of the Tasmanian aborigines in what appears to be the beach of an old lake before it became naturally drained. The site of the old lake has now been used as a reservoir so that the water level, as the result of the damming of the valley forming the present outlet of the reservoir, has now risen about 10 feet, to that of the small terrace where the implements were found. The writer takes this slight terrace to be a relic of an old shore line. It may be mentioned that under two miles to the south-east there is an aboriginal stone quarry, where large numbers of these implements were fashioned, all made from cherts. These cherts were formed by the alteration of Jurassic clay shales along their plane of contact with masses of intrusive diabase. The author would not press for this last piece of evidence proving any special geological antiquity for the "tronattas," but thinks it should be recorded, as the area is worthy of further investigation. Evidence i.b. conclusively proves geological antiquity to be something of the order of perhaps 1,500 years, for within the last 100 years no appreciable alteration has been observed in sea-level anywhere around the shores of Australia or Tasmania. i.a. can prove a far higher geological antiquity for man if the "outwash" apron material dates back to the Riss Pleistocene ice sheet. The locking up of so much ice to form the great Riss ice sheets might have lowered sea level all over the world to the extent of about 200 feet. The levels of the old valley gravels at the Tamar and Mersey Rivers, together with the submerged terraces at about $3\frac{1}{2}$ fathoms to the west of King Island, point to the sea level having been lowered in late geological time to the extent of about 200 feet, and to have paused long enough at this low level to enable it to cut back a terrace over 50 feet in



Section, looking north, showing occurrence of rough artefacts of Tasmanian aborigines in small raised beach at Regatta Point, one mile north of Launceston



Section 7 miles in length, from W. Coast of Tasmania, near mouth of Henty River, to Edcn, showing the terminal moraine marking former maximum extension of the Pleistocene ice sheet, near Malanna, together with the "outwash-apron" ("schotter") gravels.



Above section with vertical scale the same as the horizontal with ideal restoration of the Pleistocene ice sheet with a thickness of 1000 feet at Edcn.

Ice Sheet restored



height. The sea would in this case have completely retreated from Bass Strait and Torres Strait, and would have laid bare the bulk of the great Sahul shoal, or bank, and so have admitted of aboriginal Tasmanians migrating more or less dry-shod over the greater portions of the long road from their possible early home in the Malay Peninsula or Netherlands East Indies to Tasmania. The coming of aboriginal man into Tasmania may date back, on the above supposition, to a time of the order of 100,000, or more, years ago.

ii. Distribution and Number.

a. Of Stone Implements.

The stone implements of the aborigines, chiefly of the nature of scrapers for fashioning spears and throwing sticks and notching trees for climbing, are very widely distributed not only around the coast of Tasmania, but inland, particularly in the neighbourhood of the great lakes, such as the Great Lake, Lake St. Clair, etc. Some idea of the numbers may be formed from the fact that the writer last February, as the result of a quarter of an hour's search, picked up about 100 aboriginal chert flakes, almost all of which had been used as scrapers, near the present outlet of the Lake Leake Reservoir. These "tronattas" are strikingly like those found on the horizon of the remains of Piltdown man in Sussex.

b. Based on the Extent and Thickness of the Kitchen-Middens Along the Coast.

Some of the largest of these shell-mounds are to be found at Swanport, on the east coast of Tasmania. According to Mr. Clive Lord, one of these shell-mounds is no less than 10 feet deep in its highest part, and covers an area of several acres. The late Dr. Fritz Noetling attempted to estimate the approximate date of the coming of the first aborigines into Tasmania by the amount of material now to be found in the shell-mounds considered in relation to the average aboriginal population of Tasmania in the past. (1).

The aboriginal population of Tasmania is estimated at 2,000 in 1803. This population, he estimates, would consume shells of oysters, mutton fish (*Haliotis*), *Turbo*, etc., at the rate of about 120 cubic feet a year each. That would be

(1) Proc. Roy. Soc. Tasmania for 1910, pages 231-264. Plates I and II. The Antiquity of Man in Tasmania.

240,000 cubic feet a year, for the average rate of growth of the shell-mounds for a population of 2,000 aborigines. In 5,000 years the shell-mounds would have a capacity of no less than 1,200,000,000 of cubic feet. This would cover a tract of land about half a mile in width and ten miles in length, with kitchen midden to a depth of about 9 feet. Dr. Noetling concludes from this that, as this amount is probably in excess of the aggregate of all the shell material in all the kitchen middens of Tasmania, the first arrival of the Tasmanian aborigines may not have dated back more than 5,000 years from the present. That this is an underestimate would appear from the following:—

Firstly. The aborigines did not subsist on shell-fish alone, but partly on animal and plant food.

Secondly. For some considerable period of time after the coming of the first few individuals into Tasmania the population may have been considerably under 2,000.

Thirdly. The existing kitchen middens have been much reduced through various weathering processes, which have partly dissolved the shells, partly removed them by the mechanical agency of wind, water-floods, waves, etc.

Fourthly. A very important consideration is that as it is highly probable that the first coming into Tasmania of the aborigines took place during a low sea level, coinciding with one of the later Pleistocene glacial phases, the kitchen middens of that age, when sea level was some hundred to two hundred feet lower than it is now, have long since been completely submerged. If the home of the Tasmanian aboriginal was originally somewhere near the Malay Peninsula, some thousands of miles in length of shoreline, with intermittent shell-mounds, have been submerged along this assumed early road of migration. The estimate, therefore, of the date of the first arrival of the Tasmanian aborigines may have to be increased by many times the 5,000 years suggested by Dr. Noetling.

iii. Cultural Evidence.

- a. Palæolithic stage of culture of the Tasmanian aborigines.

The Tasmanian aborigines had no shield nor womerah nor boomerang, and had no knowledge of putting a cutting edge on their stone implements by grinding them down on

another stone used as a hone stone. Their implements are distinctly of a Palæolithic type, strikingly like those of Piltown man, but many of them show exquisitely fine finish by the method of re-touching, as proved by many fine specimens in the collections of the Tasmanian Museum, Hobart, as well as in those of Dr. W. L. Crowther, some of the best of which were collected near Ross and Oatlands. Their implements mostly show concave surfaces, evidently used for spokeshaving their spears and shaping their throwing sticks. These throwing sticks (*Lughrana*) had an effective range up to about 40 yards, and their spears (*Perenna*) up to about 60 yards. The latter, hardened at the point by fire, would go through the body of a man at a range of 60 yards. The club, waddy, or throwing stick was about 2 feet long, notched or roughened at one end to give a grip; sometimes knobbed at the other end. None of their stone implements was ever hafted. Occasionally in the kitchen middens may be found palettes of the nature of stone dishes, or shallow mortars, in which they ground their hæmatite for raddling their hair. They had no nets nor fish hooks, and do not appear to have eaten fish. The aboriginal women made neat baskets (*Tughbrana*), or "dilly-bags."

b. Tasmanian aborigines had no knowledge of making large dug-out canoes, or outrigger canoes, such as those used by the Australian aborigines from Hinchinbrook Island northwards to Cape York, or the large dug-out canoes, or the stringy-bark canoes used by the Australian aborigines from Carpentaria to west of Darwin. The canoes of the Tasmanian aborigines had a maximum length of 9 to 10 feet, a width of 3 feet, and a height of 1½ feet, with a depth inside of about 9 inches. They were practically three cigar-shaped bundles of bark tied together with grass string or strips of kangaroo skin so as to form a rough canoe or slightly hollowed float. They were propelled by poles whether in deep or in shallow water. Crude craft as these were, the aborigines nevertheless were able to cross in them from the mainland to Maatsuyker Island and Maria Island; the latter involved a voyage of about 3 miles. The Seri Indians in Sonora (California) in their "balsas" (30 feet long bundles of reeds lashed together) can even cross the Gulf of California in calm weather. This is from 50 to 100 miles in width. (31).

That the formation of Bass Strait, or, at any rate, the western part of it, in which King Island lies, must date

back many thousands of years into the past, is suggested by the following consideration, among others:—

The marked differentiation of the Tasmanian emu and the King Island emu (respectively *Dromaius diemensis* and *D. péroni*) from the emu of the mainland, *D. novæ-hollandiæ*, surely demands a period of geological time to be estimated by more than just a few thousands of years, probably something more of the order of 20,000 to 50,000 years. It will be noticed that King Island would have been united to the mainland of Tasmania up to the latest date of the union of Tasmania with the Australian mainland, as the old eastern land bridge by way of Flinders Island and the King Island land bridge would both be restored if the ocean level were dropped by 30 fathoms.

iv. Anatomical and Physiological Evidence.

a. Alliance of Tasmanians to the primitive negro races.

This matter will be discussed very briefly, the reader being referred to the works of reference by Professor Berry, Dr. S. A. Smith, etc., given in the Bibliography.

The Tasmanians living in the eastern half of the island were mostly of small stature, the average height of the men being 1661 millimetres=5ft. 5½in., that of the women 1503 mm.=4ft. 11¼in. The colour of their skin was rather more black than brown.

b. The mouth was big, and the teeth larger than those of any other existing race. They were ulotrichous. Cephalic index .75.

c. As regards a downward limit to the date of the Tasmanian aborigine, the fact must not be lost sight of that he was essentially *homo*, at all events, as far as relates to the types of him with which we are familiar. He had little special affinities with *Eoanthropus* or with *Pithecanthropus*.

d. Had the Tasmanian aboriginal been resident in a cool temperate climate like that of Tasmania for a vast period of geological time, one would have expected that the primitive blackness of his complexion, so characteristic of tropical peoples, would have shown some signs of passing into paler shades, such as light brown, or even white.

v. Associated Fauna.

a. It will be shown in the next division of this paper that the dingo at the Wellington Caves, in New South Wales,

and elsewhere on the mainland, was contemporaneous with extinct marsupials, such as *Thylacoleo*, *Diprotodon*, etc.; also at the Wellington Caves, a human molar tooth was found, apparently *in situ*, in the cave breccia. There can be little doubt that the dingo was brought into Australia by the early emigrating Australian aboriginal. The dingo, therefore, on the mainland, dates back to at any rate late Pleistocene time. The Tasmanian aborigines had no knowledge whatever of the dingo, which evidently was blocked from getting into Tasmania through the flooding of the old isthmus joining Tasmania to the mainland, by the waters of Bass Strait having already become "un fait accompli" before the dingo reached the shore of south-eastern Victoria. If, therefore, the Australian aboriginal dates back to late Pleistocene time, the Tasmanian aboriginal must be relegated to an older period still. Incidentally, it may be remarked that the survival in Tasmania of *Thylacinus* and *Sarcophilus* is directly due, in the opinion of Sir Baldwin Spencer, to the absence from that island of the dingo. *Thylacinus* and *Sarcophilus* ranged over nearly the whole of Australia in late Pleistocene time, but have now become wholly extinct through having been exterminated by the dingo.

b. Reference has already been made to this consideration (b) on page 119, and the reader is referred to the paper by Messrs. H. H. Scott and Clive E. Lord. With the exception of the bones of the extinct emu, *Dromornis australis*, showing evidence of having been hacked by aboriginal implements, according to the Rev. J. E. Tenison Woods, no traces have been found so far of any marks left by aborigines on bones of extinct vertebrates, either in Australia or in Tasmania. The bones of extinct kangaroo now preserved in the Ballarat Museum, and stated to show tomahawk cuts, must be looked upon as doubtful evidence of the contemporaneity of man. The observations of Heber Longman, Curator of the Brisbane Museum, show the clearest possible evidence of deeply-cut incisions made by the carnassial teeth of *Thylacoleo* on the bones of his herbivorous contemporaries. It is highly probable that careful search in the future may reveal the presence of some marks left by man on the skeletal remains of extinct marsupials or monotremes. This is a point to which the attention of future observers might well be directed.

TENTATIVE SUMMARY OF PLEISTOCENE AND RECENT DEPOSITS WITHIN THE COMMONWEALTH,
SHOWING THE POSITIONS IN THE TIME SCALE OF EVIDENCES OF TASMANIAN AND AUSTRALIAN
ABORIGINAL MAN.

Approximate Time in Years ago from Present.	Stage or Formation.	Geological Events.	Sediments.	Fauna and Flora.	Human Remains.
1,500-2,000 (?)		Subsidence of coastal block-faulted area, or eustatic negative movement of ocean? Newer Raised Beaches of Dry Creek near Adelaide, 11 feet above high water.	Sand dunes of Cape Otway, Peat beds of Coorong and Waukwine Range areas, South Australia, etc. Sands and clays. Uppermost beds of Delta deposits. Regatta Point, Launceston, raised beach, 3-5 feet.	<i>Ampullaria quoyana</i> , <i>Risella melanostoma</i> , etc.	Bone needles, stone tomahawks. Primitive types of stone scrapers.
6,000-7,000		Negative eustatic movement of ocean from 10 feet at King and Flinders Island, to 15 feet at W. Maitland, about the same at Townsville, and 23 feet near Fremantle. Seas warmer than now, for <i>Orbitolites complanata</i> has retreated equatorwards from Adelaide to Shark's Bay, where the sea water is 7 to 8 deg. Fahr. warmer than near Adelaide. Volcanic eruptions Mt. Gambier, South Australia, Tower Hill, Victoria. Possibly the crater of Lake Eachern, to the west of Cairns, Queensland, may belong to this epoch.	Basic lavas and tufts. Terrestrial sands capped by fluvialite sediments followed in turn by marine estuarine shell beds.	<i>Arca trapezia</i> , <i>Orbitolites complanata</i> , <i>Mipitilus melanostoma</i> , <i>Siphonaria marina</i> .	Aboriginal clay basins and pounding stones at "Reed-beds" near Fulham, South Australia.
7,060 (?) to 12,000 (?)	Post-Würm Mountain Glaciation	Degradation with rising sea-level. Glaciation of National Park, Tasmania, specially near the 4,000 feet contour, marked by high level terraces at Kosciusko, and moraines near Townsend's Pass, Kosciusko, 5,400-6,700 feet altitude.	Estuarine peat beds, sands, and clays of Shea's Creek, Botany Bay, near Sydney, Slits of Lake Colungula, Victoria. Lacustrine clays and silts of Lake Callabonna, South Australia. Cuddie Springs, N.S.W. Wellington Cave Breccias, N.S.W.	Existing species of Mollusca. Remains of Dugong ca. (<i>Hydrocote australis</i>). <i>Eucalyptus botryoides</i> , <i>E. resinifera</i> , <i>Banksia serrata</i> in the peat. <i>Thylacoleo</i> , Dingo. Diprotodon, <i>Gonyornis</i> , Dingo. Diprotodon, Dingo. <i>Homo</i> (?)	Four well-ground stone tomahawks at depths varying from 7 feet to 11 feet below high water level. One human molar tooth.

<p>17,000 to 20,000 (?)</p>	<p>Wurm Glaciation.</p>	<p>Last severe glaciation of Tasmania. Lakes formed in National Park at the 2,200-3,500 feet altitudes. Glaciation of Blue Lake, Kosciusko, at altitude of 6,150 feet.</p>	<p>Possible "outwash apron" stream tin drifts of the Doone Mine near Gladstone, the Pioneer Mine near Herterick, Tasmania. Torren-tial gravels (newest) of eastern Gippsland.</p>	<p>Aboriginal chalcetonic flake at 10 feet below surface in firmly compacted "outwash apron" drift? This may belong to the Riss Glaciation. (See below.)</p>
<p>20,000 to possibly 150,000</p>	<p>Riss-Wurm Inter-glacial (Durrntenian or Sangamon mild epoch).</p>	<p>Erosion. Old U-shaped valley of Pieman River, Tasmania, deepened by V valley which from Riss time to present-day has been deepened 100 to 130 feet in hard rock. Wide flats of Ringarooma Valley between Pioneer Mine and Doone Mine near Gladstone excavated in hard rock from this down to present time to depth of 50-60 feet. U-shaped valley of Snowy River, Kosciusko, below Charlotte's Pass, deepened by V-shaped notch, in hard granite, about 30 feet deep, from this date to the present.</p>	<p>Trunks of Dicksonia and shells of recent Mollusca and remains of <i>Notoherium mitchelli</i> and <i>N. tasmanianum</i>, etc. Older portion of the Darling Downs Pleistocene fauna, <i>Euryzygoma dunense</i>, Heber Longman, found at depth of 60 feet.</p>	<p>Talgai Skull of Dalrymple Creek near Warwick, Darling Downs, Queensland.</p>
<p>90,000 possibly to 150,000</p>	<p>Riss Glaciation.</p>	<p>Morainic material of National Park, Tasmania, at altitudes of 2,500 to 2,800 feet.</p>	<p>Mowbray Swamp peat deposits.</p>	<p>? Aboriginal chalcetonic flake from near Gladstone, at 10 feet below surface in "outwash apron" drift.</p>
<p>250,000 to possibly 400,000</p>	<p>Riss-Mindel Inter-glacial (mild epoch), Helvetian or Tyrolean or Yarmouth. Mindel Glaciation.</p>	<p>Maximum development of the Tasmanian Pleistocene ice sheets, and the "calotte" ice of Mt. Kosciusko.</p>	<p>Great terminal moraine with rotted blocks of diabase, 2 feet through, between mouth of Henty River and Lower Eden Valley, Western Tasmania, near Malinna. Out-wash apron gravels of Strahan. Kosciusko-Snowy River moraines at 5,000 feet level.</p>	

B. Evidence of the Antiquity of Aboriginal Man in Australia.

To whatever date the first coming of the Australian aborigines into Australia be assigned, it is obvious that the first arrival of the Tasmanian aborigines in Tasmania antedates it.

It is next important for our inquiry to review any evidence as to the geological antiquity of man in Australia.

Such evidence may be classed as:—

- i. Legendary.
- ii. Based on the age of the deposits in which remains of man or any of his artefacts, or other traces of his handywork, have been found.
- iii. Based on anatomical structure of the human remains.
- iv. Based on the age of the dingo on the assumption that the dingo was introduced into Australia by the early Australian aboriginal immigrants.

i. Legendary.

- a. James Dawson states, "An intelligent aboriginal distinctly remembers his grandfather speaking of "fire coming out of Bo'ok (a hill near the town of "Mortlake, in Victoria) when he was a young man."
- b. Dawson also states that when volcanic bombs from the extinct volcano of Mt. Leura were shown to an aboriginal native of Colac, Victoria, the aboriginal said that "these were stones, which his forefathers "told him had been thrown out of the hill by the "action of fire."
- c. Similar legends of aborigines having seen Mts. Franklin and Buninyong in eruption have been recorded.

Too much reliance cannot be placed on these statements, especially the former, as the aborigines may have been practically repeating what they had picked up earlier from some white people.

- ii. Evidence based on the age of the deposits in which remains of man or of his artefacts or other traces of his handywork have been found.
 - a. Bennett has recorded the finding of grooves made by aborigines honing down or sharpening their tomahawks on sandstone surfaces 30 feet below the sur-

face of the ground, the overlying material being the alluvium of the Hunter River, in the Maitland district, New South Wales.

In view of the rapidity with which the Hunter River changes its channel from time to time, as the result of floods, this evidence must be accepted with caution, as being quite inconclusive, unless supported by other evidence.

- b. Gerard Krefft (7), (8), a former curator of the Australian Museum, Sydney, records the finding by himself of the "fractured crown of a human molar tooth in the same matrix as *Diprotodon* and *Thylacoleo* at Wellington, in this colony" (the Wellington Caves of New South Wales).

Commenting on this remarkable discovery, Mr. R. Etheridge, jun. (7), concludes that this would be much the most important evidence up to date as to the geological antiquity of man in Australia, if it were certain that the molar had been found in the same mass of cave breccia as the remains of the extinct marsupials. There is still some of the red cave earth adherent to this tooth, which is preserved at the Australian Museum, but there is no trace of any adherent breccia. At the same time the statement of a scientist like Mr. Krefft, that he actually found the tooth in the breccia, must surely be accepted.

Mr. Etheridge has figured this tooth (*vide* Rec. Aust. Mus., XI., 2, p. 31, and Pl. 12, figs. 3-4, 'Exploration of Caves and Rivers of N.S.W.' Parliamentary Paper 1882).

Important confirmatory evidence as to the tooth having been *in situ* in the breccia is supplied by the fact that teeth of dingo (*Canis dingo*) occur *in situ* in the bone breccia of the Wellington Caves, in association with bones of *Thylacoleo*, *Sarcophilus*, and *Diprotodon*. The value of this evidence rests, of course, on the assumption that the dingo was boated over to Australia by the early Australian aborigines (9).

- c. Mr. James Bonwick (7) states, "at Ballarat, a basaltic stone weapon or tool-head, was unearthed in "in the process of gold-prospecting, 22 inches below "the surface, in a place which evidently had been "disturbed."

- d. The late Rev. J. E. Tenison Woods states that bones of *Dromornis australis* have been found in South Australia, scraped and cut by aborigines. Unfortunately, no figure of these bones has been published, and the bones themselves cannot now be traced.
- e. The late C. S. Wilkinson records that (39) in 1864 he found at a spot 2 miles east of the Cape Otway lighthouse, flint chips, and a sharpened stone tomahawk, and several bone needles. Mr. R. Etheridge, jun., has reported (6) that in 1865-66 he found a bone spike in beach material, formed of pebbles and broken shells, and apparently passing under the sand dunes. As the dunes near the scene of Mr. Wilkinson's discovery are 200 feet in height, it is assumed that the deposit is of some antiquity. In view, however, of the speed with which dunes come and go, this evidence seems inconclusive.
- f. C. S. Wilkinson states (39) that "a stone hatchet has "been obtained on the Bodalla Estate, in the alluvium, at a depth of 14 feet." In the absence of details as to the rate at which this alluvium has accumulated, this evidence is of small value.
- g. C. G. W. Officer describes the imprints of human feet and buttocks in the consolidated calcareous dune rock of Warrnambool. These are very possibly genuine human impressions, though some doubt this. In any case, they do not necessarily prove a high geological antiquity for man in that region (23).
- h. Messrs. R. Etheridge, jun., T. W. Edgeworth David, and J. W. Grimshaw have placed on record (8) the finding of no less than four stone tomahawks at Shea's Creek, near Botany Bay, in the Sydney District.

In the same paper they describe and figure the remains of a dugong, the bones of which show conclusive evidence of having been hacked by aborigines. The top of the skeleton of the dugong was about 5 feet below mean high tide, and the base of the skeleton about 7 feet below. The skeleton was covered partly by peat, partly by estuarine clays. It is thought that sea level has risen by about 5 feet since the aborigines feasted on the dugong.

As regards the stone tomahawks, two were found at 11 feet below mean high water mark, in a sump hole, and are said to have been found in peat, or on the surface of the peat. Peaty beds were intersected there at various levels, the lowest bed occurring at 10 feet below low water. Numerous stumps of swamp mahogany (*Eucalyptus botryoides*), mahogany (*Eucalyptus resinifera*), honey-suckle (*Banksia serrata*), occurred *in situ* in the peat, representing a submerged forest. One of the banksia stumps at 10 feet below low water level, that is, at about 14 ft. below high water, showed clear evidence of having been burnt off at the top, while *in situ*. The roots were also charred. The burnt stump is not, in itself, conclusive evidence of the presence of man, as the fire may have been due to natural causes. In connection with this, it may be mentioned that in a bore put down by a geological party from the University of Sydney, with the assistance of Mr. G. H. Halligan, charcoal was found, obviously caused by a contemporaneous fire, at about 60 feet below sea level, near the southern end of the bridge over the Narrabeen Lagoon, about 7 miles north of Sydney Heads. Had only one stone tomahawk been found at Shea's Creek, at 10 feet below high water mark, it might have been argued that it was accidentally dropped overboard from a canoe, but the finding of no less than four between 7 and 11 feet below high water mark, taken in conjunction with the fact that the bones of the dugong, now buried to a depth of 7 feet below high water, under estuarine clays and peat, had been hacked by aborigines, is good proof that sea level in that locality has risen considerably to the extent of at least from 7 to 11 feet since the imbedding of the tomahawks. When it is considered that tidal observations in various harbours around Australia and Tasmania show no appreciable variation in sea level for the past fifty years, a variation of sea level, in so relatively stable an area as that of Botany Bay, of from 7 to 11 feet, probably indicates an antiquity of not less than a few thousand years.

- i. Captain S. A. White (38) and Professor Walter Howchin (13) state that at the Reedbeds, near Fulham, South Australia, the sands and clays, on being

excavated, revealed three aboriginal basins, formed of clay. With these "dipping basins" for holding water on the surface of the sand [as practised now at Kisimayu, on the East Coast of Africa (*f.* S.A. White)] were found six undoubted artefacts, mostly pounding stones, hammer stones, etc. This was at a depth of approximately 8 to 9 feet below high water. Therefore, there has been a positive movement of the sea there, or a negative movement of the land of at least $8\frac{1}{2}$ feet since man made the clay "dipping basins." This evidence, so remarkably in accord with that of Shea's Creek, is suggestive of a eustatic positive movement of the ocean since the occupation of the Adelaide and Sydney areas by aboriginal man.

- j. Mr. Walter Enright (5) has recently recorded the occurrence of an aboriginal tomahawk *in situ* at Font Hill, near West Maitland, at 11 feet below the surface. This was found in a bed of clay at the Maitland Colliery Shaft.

iii. Based on anatomical structure of the human remains.

The Talgai Skull.

The state of mineralisation of this skull would not, in itself, be a proof of high antiquity, inasmuch as Dalrymple Creek, near Talgai Station, where it was found, deposits a considerable amount of carbonate of lime in a relatively short space of time. But the dentition is considered to be distinctly archaic. The left canine of the upper jaw is not only unusually large, but is separated from the adjacent tooth by a diastema, and is strongly faceted on the side where the canine of the lower jaw slid past it in such a way as gradually to grind this facet. Such an interlocking of the canine teeth, so characteristic a feature in the Piltdown man (*Eoanthropus dawsoni*) of Sussex, is, of course, a special attribute of the anthropoid apes. It should here be mentioned that Professor Keith considers that this skull has affinities with those of the Tasmanian aborigines, but his opinion is not shared by other anthropologists and anatomists. If, therefore, this skull be that of an Australian aboriginal, a later immigrant than the Tasmanian, the first coming of the Tasmanian into Australia must have been still more remote in time.

- iv. Based on the age of the dingo on the assumption that the dingo was introduced into Australia by the early Australian aboriginal immigrants. (9).

Remains of dingo (warrigal) have been recorded at the following:—

- a. At a cave in basalt on Toolern-Toolern Creek, 5 miles S.E. of Gisborne, in Victoria, in 1857, C. D'Oyly, H. Alpin, with Dr. A. R. C. Selwyn, found perfect skulls of dingo, of the Devil of Tasmania (*Sarcophilus ursinus*), etc. (2).
- b. At Lake Colungulac, near Camperdown, cranial remains of dingo, as well as remains of *Thylacoleo carnifex*, were figured by McCoy from the lake alluvial deposits. (3).
- c. From alluvial deposits at Lake Timboon, Co. Heytesbury, Victoria, R. B. Smyth states that remains of *Canis dingo* were found with those of *Sarcophilus ursinus*, Harris, *Macropus titan*, Owen, and *M. atlas*, Owen, and of *Nototherium* and *Diprotodon*. (4).
- d. Smyth also states (*op. cit.*, p. 149) that in sinking a well at Tower Hill volcano, near Warrnambool, after penetrating 63 feet of basaltic tuff, dried grass of an old land surface was struck, then blue and yellow clay, and at further depth of 60 feet, that is, 123 feet below the surface, the skull and bones of a dingo were found. Much doubt, however, exists as to the authenticity of this discovery, and the statement is now discredited.
- e. The late Professor R. Tate states (5) that the Warrigal and *Diprotodon* "whose remains are found beneath the ashes of the Mt. Gambier volcano" were contemporaneous. This statement is also now seriously called in question.
- f. Kreffl (6) records the occurrence of the first two molars of the lower jaw of a dog in a cave breccia from Wellington, New South Wales, associated with remains of *Thylacinus*, *Sarcophilus*, and *Diprotodon*. Mr. R. Etheridge, jun. (7), verified the occurrence of teeth of *Canis* in the cave-breccia specimens from Wellington, in the collections at the Australian

(2) Selwyn, Q.J.G.S., XVI., 1860, p. 115.

McCoy, Ecol. Sur. Vict. Notes attached to Quarter Sheet, vii., N.W.

(3) McCoy, Prodromus Pal. Vict., Dec. vii., 1882, pp. 8 and 9.

(4) Smyth, Aborigines of Victoria, i., 1878, pp. 149-150.

(5) Trans. Phil. Soc. Adelaide, 1878-79 (1879), p. LXX.

(6) Geol. Mag. ii., 1865, p. 572.

(7) Mem. Geol. Sur. N.S.W., Ethnological Series, No. 2, p. 50.

Museum, Sydney. This evidence is important, as confirming that of the human molar tooth, already quoted.

- g. Professor J. W. Gregory ⁽⁸⁾ records finding remains of *Canis dingo* associated with those of *Thylacinus*, in the N.E. part of the Lake Eyre region, on the Diamantina.
- h. Professor Wood Jones ⁽¹⁵⁾ states that "the Dingo "falls into line with all the other races of domestic "dogs, in being of the true northern wolf type. "Moreover, in the large size of the carnassial teeth "he approaches nearer to the ancestral type than do "the other races of dogs of which I can obtain speci-"mens or records" (*op. cit.*, p. 258).

Wood Jones concludes that the Dingo, unaided by man, could never have crossed Wallace's Line (the Strait of Bali-Lombok), which is 15 miles in width, or other still wider straits separating Timor from the Sahul Bank, or the nearest other islands of the Netherlands East Indies from New Guinea. He summarises thus:—

"The progenitor of the Talgai man came with "his wife, he came with his dog, and with his dog's "wife, and he must have done the journey in a sea-"worthy boat, capable of traversing this unquiet part "of the ocean, with his considerable cargo. Be-"sides this living freight, and the food and water "necessary for the adventure, he carried other things "—he carried a knowledge of the boomerang, of the "basis of a totem system, and various other cultural "features, all bearing a strange suggestion of very "distinctly western origin" (*op. cit.*, p. 263).

All this evidence combines to show:—

1. That man in Australia was almost certainly contemporaneous:—

(a) with extinct marsupials such as *Diprotodon*, *Thylacoleo carnifex*, etc.

(b) With extinct birds such as *Dromornis australis*.

2. That the Dingo, or Warrigal (*Canis dingo*, or *Canis familiaris dingo*), was certainly contemporaneous with extinct marsupials in Australia, and that he was almost certainly introduced into Australia by aboriginal man.

(8) Dead Heart of Australia, pp. 78 and 152.

PART III.
SUMMARY.

The table herewith is only a very tentative and provisional attempt to approximate to the relative antiquity of the various evidences adduced as to the age of aboriginal man in Tasmania and Australia.

From the arguments already deduced the following conclusions may be provisionally drawn:—

(1) That the limiting of the date of arrival of the first Tasmanian aborigines to some such period as about five thousand to seven thousand years, on the evidence of the size of the refuse mounds or kitchen middens, left by the aborigines, is apt to mislead for the following reasons:—

First, the kitchen middens are liable to be considerably reduced in bulk through being dismantled by floods, winds, etc., as well as solution by rain water, so that they are very much smaller now than they formerly were.

Secondly, a large proportion of the aboriginal inhabitants of the island did not dwell along the coast, but subsisted on animals and plants, which they found useful for food, in the inland areas. Thus out of the total population of aborigines in Tasmania in 1803 of two thousand, as estimated by Dr Noetling, perhaps only one-half inhabited the coastal areas, and so contributed to the kitchen middens. If this has been so in past time, the limit assigned by Dr. Noetling of seven thousand years would have to be doubled.

Thirdly, that while the evidence of aboriginal flaked implements, *in situ*, in the cemented raised beach at Regatta Point, near Launceston, points to the aborigines having inhabited the northern part of Tasmania at a time when sea level was perhaps some three to five feet higher than it is at present (perhaps 1,500 to 2,000 years ago), the remarkable evidence of the Chaleedonic flake (beautifully finished by retouching by the aborigines) *in situ*, in a deposit probably of fluvio-glacial origin, near Gladstone, in N.E. Tasmania, carries the date back probably to an epoch approximately contemporaneous with some important phase of Pleistocene glaciation. If aboriginal man in Tasmania was really contemporaneous with one of the last great ice ages, he must have witnessed a sea level, perhaps no less than 200 feet lower than it is at present. This lowering of sea level was due to the locking up of enormous volumes of sea water which went to form some eleven millions of square miles of Pleistocene ice sheets.

Soundings of the sea between the Malay Peninsula and Tasmania show that, but for a few relatively narrow deep straits, such as those of Sunda, of Bali-Lombok, and the trench between Timor and the Sahul bank, the ancestors of the Tasmanian aborigines would have been able to cross over on dry land from that famous *tête-du-pont* for migrations across the Pacific of early man—the Malay Peninsula (if they ever came from that quarter)—all the way to Tasmania. Obviously, as Torres Strait is not more than sixty feet in depth, and Bass Strait about 180 feet (along the line of shallowest ridge connecting it with the mainland), a fall of sea-level of 200 feet would completely unite Tasmania with New Guinea. If the Tasmanian aborigines arrived by such “strange roads” as now “go down” beneath the sea, and if in the earlier stages of their wanderings they followed the shore lines, and subsisted largely upon shell-fish, the bulk, indeed perhaps by far the greater portion, of their kitchen middens would now be submerged, many of them under Bass Strait. This submergence would result from the gradual rise in sea level, due to the thawing of the huge ice sheets of late Pleistocene geological time.

2. Next, the absence of any knowledge of making sea-going canoes on the part of the Tasmanian aborigines, such as would tend to their negotiating safely a strait of the present width of Bass Strait, strengthens the belief that they must have crossed at a time when the straits were either far narrower than now, or did not exist at all. We are now in a position to estimate very approximate date in absolute time for the arrival of our aborigines in Tasmania. The evidence at Launceston pointing to a higher sea level than at present, to the extent of about three to five feet, belongs probably to the epoch of greater warmth than at present (about 4 deg. Fah.), which followed on soon after the final melting away of the last of the great Pleistocene ice sheets. This raised the sea level apparently all over the world by about fifteen feet. Subsequently, possibly through the resorption of sea water by very recently expanding polar ice caps, sea level has since been lowered by fifteen feet. If the maximum sea level, namely fifteen feet above its present level, took place seven thousand years ago, the Regatta Point evidence may indicate an antiquity of about 1,500 to 2,000 years. Obviously, this is an absolute minimum date. Next, it has been shown that the dingo was brought into Australia by the Australian aboriginal, the dingo being a domesticated wolf imported by the Australian aboriginal from Asia. This

evidence suggests that to whatever age the dingo belongs, the Australian aboriginal is equally old. Geological evidence shows that on the mainland the dingo was contemporaneous with some forms of extinct marsupials, such as *Thylacoleo*, *Diprotodon*, etc. This alone, carries back the coming of the Australian aboriginal into Australia to many thousands of years ago.

3. If the aboriginal flake discovered in the Doone Mine deposit belongs to the Epoch of Würmian Glaciation, it may date back to 20,000 years. If, however, as seems not improbable, it dates back to the time of the Riss Glaciation, then the antiquity would be of the order of about 100,000 years.

4. The Talgai skull of the Darling Downs, near Warwick, in Queensland, although regarded by Professor Keith as essentially that of a Tasmanian aboriginal, is considered by others to be more Australian than Tasmanian. If the latter view is correct, the anthropoid ape characteristic evidenced in the size and faceting of the canines shows again the high geological antiquity of the Australian aboriginal.

5. This is supported by the occurrence of remains of dingo, and of a human molar tooth in the cave breccia at the Wellington Caves, in New South Wales, the dingo remains certainly, the human molar doubtfully, in association with remains of *Thylacoleo*.

6. However far back the date of arrival of the Australian aboriginal is pushed into the past, the coming of the Tasmanian must have been older still, for neither the Australian aboriginal nor the dingo has ever found his way into Tasmania. The obvious explanation is that at some time subsequent to the arrival of the Tasmanian aboriginal in Tasmania, during the low sea level which laid bare Bass Strait, the sea returned in its strength, as the result of the melting of the great Pleistocene ice sheets, and stopped the Australian aboriginal and the dingo from migrating into Tasmania.

7. We have seen that in the Northern Hemisphere the very early men, such as those of Heidelberg in Germany, and Piltdown in Sussex, date back to possibly over a quarter of a million years ago, whilst the ape man of Java, the *Pithecanthropus*, may be fully half a million years old.

Now as regards the backward limit in time for the Tasmanian aboriginal, it may be noted that their anatomical structure shows little approach to *Pithecanthropus*, or to the old men of Heidelberg or Piltdown. Piltdown man, in particular, is considered by Professor Grafton Elliott Smith and John

Hunter to be in the direct line of ascent of man from the ancestral stock from which the modern anthropoid apes diverged. If the age of Piltown man is to be referred back to Günz-Mindel inter-glacial time, he might be 300,000 to 400,000 years old. The Tasmanian aboriginal would be newer than that.

8. The fact may again be emphasised that whereas there is little doubt that the earliest members of the human family inhabited the tropics, and had black skins, and that the black men slowly became white, as the result of living for thousands of years in cool temperate climates (and so we should expect that the Tasmanian aboriginal, if he had been in occupation of Tasmania for a very long period, would have shown some change in colour of his skin from black towards white), there is no evidence that the skin of the Tasmanian aborigines was other than black, right up to the time of their extinction in 1877.

On the whole, then, the evidence is in favour of the Tasmanian aboriginal having arrived in Tasmania between about twenty thousand and one hundred thousand years ago. As regards their original home, the opinion of the late A. W. Howett, later supported by Professor Griffith Taylor, is that they came from Asia, being closely allied to the negrito type of Semangs, who inhabit the highest ridges of the Malay Peninsula. These peoples have the same strongly curling hair, etc., as the Tasmanian aborigines. In the same region, but at lower levels, are aborigines known as the Sakai. These have many close affinities with the Australian aborigines.

The opinion, however, of Professor Sir Baldwin Spencer is that possibly A. W. Howett's conclusions will now have to be modified. Spencer states in a letter to the writer: "The Tasmanians are not now regarded as true Negritos. They are probably a remnant of a very ancient ulotrichous (woolly-haired) people, the ancestors alike of the Negritos, now isolated in the Andaman Islands, Malay Peninsula, (Semangs), and Philippines (Aetas), and possibly also of the Tasmanians, but even this is doubtful as the Negritos were brachycephalic (cephalic index, 80-85), whilst the Tasmanians were dolichocephalic or mesaticcephalic (cephalic index, 75), and seem to represent a distinct offshoot of these very early ulotrichous people, who may also have spread beyond New Guinea to the Western Pacific."

In regard to the Australian aboriginal and his origin, Sir Baldwin states (also in a letter to the writer): "The Australians of the present day seem to belong to a dolicho-

“cephalic, cymotrichous group, usually now spoken of as pre-Dravidians, surviving relics of whom elsewhere are possibly “the ‘Jungle Tribes’ of the Deccan, the Veddas of Ceylon, “and the Sakai of the Malay Peninsula; but the Australians “have developed along various lines, perhaps independently of “contact with other peoples.”

While, therefore, the original centre of dispersal of the Tasmanian aborigines is still in doubt, that of the Australian aborigines was probably in Asia, the home, too, of the dingo.

In regard to future geological researches on the antiquity of man within the Commonwealth, and particularly of the Tasmanian aborigines, attention should, in the opinion of the writer, be directed, *inter alia*, to the following:—

1. Systematic exploration of the oldest and largest kitchen middens, like those of Swanport, the Derwent Estuary, Macquarie Harbour, Mussel Roe, etc.
2. Search for aboriginal implements, etc.—
 - (a) In the 15 feet (above high water) raised beach deposits of the E., N., and W. coasts of Tasmania, and the islands of Bass Strait.
 - (b) In the older dunes, like those of King Island, Flinders Island, etc. Those of King Island have already yielded interesting remains of *Nototherium* and *Zaglossus harrissoni*.
 - (c) In peat deposits, like those of Mowbray Swamp.
 - (d) In cave deposits, like those of Mole Creek.
 - (e) In older terraced river gravels, dating back into the Pleistocene, including fluvio-glacial “out-wash-apron” deposits.
 - (f) At aboriginal “quarries” for stone for their stone implements, or at places where they dug out lumps of hæmatite for pounding into raddle for colouring their hair.
 - (g) In any dredgings in Bass Strait or adjacent estuaries, or in excavations for harbour works, a very great *desideratum* for the dating of the first coming into Tasmania of the Tasmanian aborigines would be the zoning and correlation of the Pleistocene glacial and inter-glacial deposits of Tasmania, with a view to making a time scale for the Southern Hemisphere for comparing with the standard time scale of the Northern Hemisphere.

What seems to be specially needed is a systematic mapping of all the glacial evidences, beginning with the oldest, those on the West Coast. There the great terminal moraine, so well seen in the railway cuttings in the Lower Eden Valley, can be followed north and south, and the outwash-apron gravels together with their peat beds should be carefully differentiated. The retreat of the great ice sheets, belonging perhaps to Riss or Mindel, or even Günz time, should be carefully followed up, traces of terminal moraines, Kames (esars), drumlins, trend of grooves on pavements, carry of erratics, nature, thickness, and time value of varve clays should be noted, together with positions and boundaries of existing or silted up (most of these older Pleistocene glacial lakes have been silted up), glacial lake basins, often with a great rock bar (or "riegel") helping to form the lake. Then estimates of the former thickness of the ice sheet may be formed from a close study of the height up to which old glacial markings can be traced on "tinds," "horns," or "nunatakr." Afterwards evidences of the later glaciations superimposed on the older can be studied and mapped, culminating in the final small mountain glaciers.

Truly, a fascinating and awe-inspiring quest! Any one familiar with the phenomena of existing Polar ice sheets and Alpine glaciers can visualise the tiers of Tasmania under their snowy mantle with great glittering ice-fields between; can see the glorious sapphire blue of the deep crevasses where the ice sheet plunged down the steep mountain escarpments of the West Coast, and mark the long sinuous lines of moraine streeling away from nearby nunatakr to be lost to sight in the far distance; can hear the harsh roar of the sub-glacial stream rolling its tawny waters past the great terminal moraine, and spreading, far beyond, its alluvial fan of gravel and sand; can follow every phase in the retreat of the ice invader; the ponding back of the glacial streams to form lakes in rear of the terminal moraines, the silting up of the older lakes and their passing into peat swamps and button grass flats. And then, too, he can see all the wonderful phenomena of the re-advance of the ice, as told so well for Switzerland by Nussbaum, and finally view the highlands alone snow-covered, the white of the corrie glaciers, framed in dark rock, while all the rest of the isle is under a living garment of green.

What changes the Tasmanian man must have witnessed. Probably some of these glacial phases with the gradual drowning of the Bass land bridge, which so effectually check-

ed the Australian Pharaoh and his hounds by the Victorian bank. What difference if any, ensued in his culture as the result of this isolation from the mainland?

Then with what animals was the Tasmanian man contemporaneous?

Did he see the marsupial rhinoceros alive, and, if so, did he defend himself against him with his spears and throwing sticks?

The whole problem teems with interest, and is worthy of devoted work from many workers.

Whoever may follow this trail in the future should never forget that the man who blazed it was the man whom we specially delight to honour to-night.

One cannot conclude this memorial lecture on the Geological History of the aborigines of the Commonwealth without some thoughts for the future as well as the past.

Unfortunately, most unfortunately, these most primitive children of men, the genuine Palæolithic type of hunters, the Tasmanian aborigines, are extinct, have been extinct since 1877. Most unfortunately, our remaining Australian aborigines are fast becoming extinct. These people whom we have dispossessed of their hunting grounds, and mostly driven into the most inhospitable and arid areas of the Commonwealth, will soon share the fate of the Tasmanian aborigines, unless we quickly change our method of dealing with them, and cease interfering with their normal mode of life. They must not be allowed to live in houses, they must be discouraged from wearing more than the very minimum of clothing. They must be prohibited from opium, alcohol, and every form of the white man's vices. These conditions can be secured for them if we have the will, in two ways: (1) When they are in actual employment as stockmen, domestic servants, etc., on stations, by treating them firmly, but kindly, as I saw them treated by Mr. and Mrs. E. R. Kempe, on Sir Sidney Kidman's station at Macumba, near Oodnadatta. There they are healthy and happy. (Secondly). Where they are not in the employ of white people, they should have suitable reserves made and maintained for them as has been so eloquently advocated by Sir Baldwin Spencer, of Melbourne, and Captain S. A. White, of Adelaide. The North American Indians were becoming extinct until our American cousins seriously took up the subject of their preservation, and secured for tribes like the Navajo Indians suitable reservations, with proper hygienic regulations. Now the Navajos

have ceased to decrease in numbers, and are actually increasing. We could secure surely the same happy state of things for our Australian aborigines if we had the will to do it, and it is part of our solemn duty and service to humanity to have the will and to see that the lot of our aboriginal is made as happy as may reasonably be. This about the Navajos we have learnt through the recent Pan-Pacific Congress, and the Congress has made us realise more than ever before our responsibilities to the native races of the Pacific in our own or in mandated territories and protectorates (9).

Many of these highly interesting peoples have become extinct, many are fast becoming extinct, partly through diseases endemic in the islands, partly through diseases introduced by the white man.

At the Pan-Pacific Congress, Dr. Cumpston, Chief Medical Officer to the Commonwealth, weighed his words well when he said that if half the cost of a modern battleship were expended, over a period of five years, on eliminating diseases and providing proper hygienic conditions for the native races within the shores of the Pacific, all those distressing diseases of tonu (Yaws), filaria, hookworm, and many others which cause so much suffering and premature death, could be completely eradicated.

Surely, surely the great nations around the Pacific should co-operate without delay in setting in hand such a work not only for the sake of our own health, as well as that of the Pacific peoples, but for the sake of that humanity which should raise modern man to heights undreamed of by his Palaeolithic ancestor.

Certainly the noble character whose memory we cherish so particularly to-day would, were he among us now, have been foremost in this pleading, for as Sir John Dodds has said of him: "The actions of his life appear to be governed by "those principles of justice and kindness towards others which "God has established as the only true guide to human conduct."

Carlyle says truly that man in this life is attended by "the Terrors and the Splendours." Johnston saw much of both, and who does not, but his face was set upon the Splendours, and we are thankful to him, devoutly thankful, for helping us to realise the good and grandeur and the sacred mystery in human life.

(9) The resolution of the Congress urging the need for the establishing of a Chair of Anthropology at an Australian University is to be submitted for, it is hoped, favourable consideration to the Federal Government.

This memorial to him stands for a sign and for a promise. For a sign that we honour him, for a promise that we always will honour duty so well and nobly done.

PART IV.

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