27. *Egretta garzetta*, Little Egret.

Two records for the district. At Coolart on 28th June 1964, a lone bird was identified. During June 1965 a single bird was noted on several occasions along Tulum Creek. H4, 5.

28. *Egretta intermedia*, Plumed Egret.

The occurrence of this rare Egret around the mud flats of Westernport has already been mentioned under early records. On 5th January 1963, a single medium sized Egret was noted feeding along Hanns Inlet. The bird was still in partial breeding plumage. A close approach was effected and through binoculars, it was apparent the species was not a Little Egret as first thought. The bill was distinctly reddish and the legs carried a strong reddish tinge above the knees. The bird still carried rather ragged plumes on the back and breast. In view of these diagnostic features the Egret was identified as the Plumed. Almost a year later to the day in the same location a lone Egret was noted, this time in eclipse plumage. The bird appeared like a miniature White Egret with a noticeably stout bill. It is probable that this bird was also a Plumed Egret. H2.

29. *Egretta alba*, White Egret.

Consistent records of from 1 to 5 birds along Hanns Inlet and the mud flats all months of the year through the systematic survey period. The species was first recorded at Coolart during July 1963 when a single bird took up residence for several months. During March 1964 three birds were listed and later in June 1965 six birds were seen. Single birds occasionally noted feeding along Tulum Creek. H2, 4, 5.

30. *Nycticorax caledonicus*, Nankeen Night Heron.

Often noted by naval personnel in the pines along Hanns Inlet. Only two occurrences at Coolart. A single mature bird during December 1963 and an immature during March 1965. A further bird was seen along Tulum Creek on 4th February 1969. The species breeds extensively in pine trees on a property near the industrial area at Denhams-Beach. H2, 4, 5.

31. *Botaurus poiciloptilus*, Brown Bittern.

In spite of extensive suitable habitat throughout the survey area, the only records came from the Tulum Creek area. These were interesting in that a single bird was noted during June of 1964, 1965 and again in 1966. H4.

REFERENCES:

(1) A. J. Campbell (1853-1929). "Nest and Eggs of Australian Birds" (1900), p. 1015.

(2) K. Bowden, "Westernport Settlement and its Leading Personalities" (1970), Halstead Press.

(3) A. J. Campbell (1853-1929). "Nest and Eggs of Australian Birds" (1900), p. 1015.

(4) H. W. Wheelwright (1815-1865). "Bush Wanderings of a Naturalist" (1861).

(5) A. J. Campbell. "Nest and Eggs of Australian Birds". Many of G. E. Shepherds' (died 1932) records are contained in this work.

(6) A. J. Campbell. "Nest and Eggs of Australian Birds," p. 805.

(7) A. J. Campbell. "Nest and Eggs of Australian Birds."

(8) S. P. Townshead. Original manuscript in the R.A.O.U. archives.

(9) Jack Jones. Original manuscript in the R.A.O.U. archives.

(10) Phillip Brooke. "Bird Observer," October and November 1953.

(11) W. Roy Wheeler. Early list in possession of the authors. Recent list in Wheeler's own possession.

Geology of Royal Park

by G. B. PRITCHARD

Editor's Introduction
by Thomas A. Darragh*

Those of you interested in the geology of areas in and around Melbourne have probably read *The Geology of Melbourne*, an exceptionally readable little book, written by Dr. George B. Pritchard and published in 1910. G. B. Pritchard was a well known Victorian geologist and lectured in geology at the Working Men's College, now the Royal Melbourne Institute of Technology, from 1892-1934. He was a member of the Field Naturalists' Club of Victoria from 1902, contributing 14 articles to *The Victorian Naturalist*. An outline of his career is given in an obituary published in January 1957 (*Victorian Naturalist* **73**: 142-143) and a bibliography of his published writings was compiled by F. S. Colliver in 1947 (*Victorian Naturalist* **64**: 33-36).

In February 1959 the National Museum of Victoria received a collection of his correspondence and papers and amongst these was an almost completed manuscript of a small book entitled *Old Port Phillip History as told by the geology of Royal Park*.

Evidently it was a sequel to *The Geology of Melbourne* and *Old Yarra History* (1944). From internal evidence and associated papers it appears that it was written about 1947, when he was in his seventy-eighth year, however much of the information for it and some of the photographs were gathered by Pritchard in the period between 1890 and 1910. Some of the information therein is not available in any published work because many localities he examined are no longer available to us due to housing developments and land reclamation. As there is not a great deal of literature on the localities he describes available to the interested amateur, and because of the importance of the information in the manuscript, it was felt that it might be appropriate to publish the chapters of his book which still have value at the present time. Particularly as his style of writing and approach to the subject are such that his text can be easily followed by any interested person without a geological background.

In order to ensure that the text is clear, minor corrections have been made in his geological and stratigraphical terminology, but these are few and the work is substantially as he wrote it.

* * *

HISTORICAL BACKGROUND

The original area of Royal Park was 692 acres; it extended from Mount Alexander Road over to Sydney Road. The Sydney Road frontage was early cut off and subdivided for residential purposes to satisfy some early speculators. An area of 55 acres was enclosed as the Zoological Gardens. A further area of 140 acres was taken up by an experimental farm. The Railway running through the Park took off another 24 acres, and later the Electric Tramways absorbed seven acres. So the original parklands have been whittled away for some time. The most recent alienation has been the entire occupation of the area by troops to the exclusion of the general

*National Museum of Victoria.

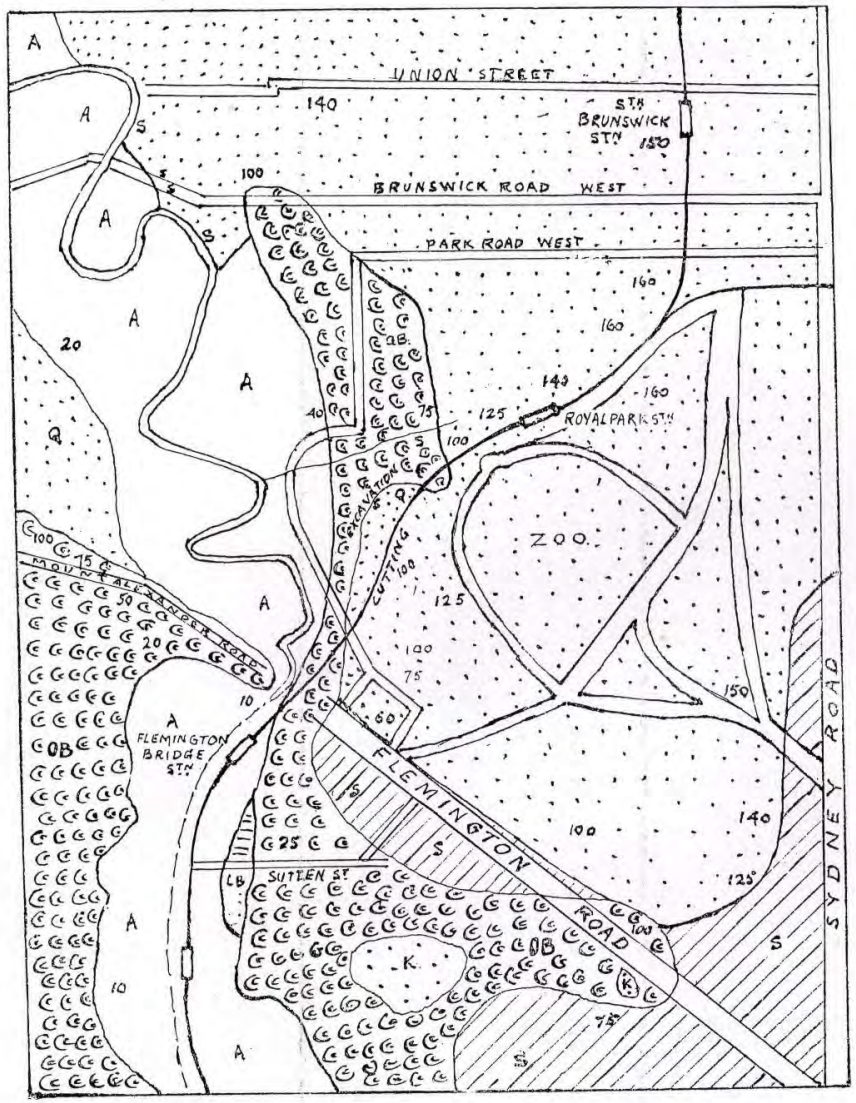


Fig. 1 — Geological Map of the Royal Park Area.

public, followed by the use of military buildings for the temporary housing of certain civilians. (Now removed, Ed.)

Based on the strongest recommendation by Robert Hoddle, Governor Latrobe reserved from sale a belt of land around the original city which included Royal Park and Princes Park in addition to the Flagstaff Gardens, the Carlton and Fitzroy Gardens, the Yarra and Fawkner Parks and the Botanic Gardens. The public is awakening to the value of these breathing spaces and a recent move has been taken to acquire a further 50 acres in the Royal Park area from Brunswick Road downstream to within a quarter of a mile of Flemington Bridge.

Fossils were found in this area in the early fifties in the Tertiary Rocks on both sides of the Moonee Valley, but it was not until the Railway cutting was made through the Royal Park in 1882 that the fact became generally known and collectors soon began to multiply.

One of the earliest building stones of Melbourne was quarried in Royal Park as well as from the valley face on the opposite side of Moonee Ponds Creek on the property of Mr Glass, and to the south of Madden's old home on Mount Alexander Road. The stone was a dark brown ferruginous sandstone and was a strong durable type. Our early architects and civilians were not very favourably impressed with it judging by some of the remarks printed in some of our early records. Its earliest use for jails and churches seemed to strike an unpopular note with the civilians of that period.

Iron ore was another early record from this locality, but although quite a good collection of iron minerals from a student's viewpoint can still be gathered including hematite, limonite, turqite, geothite, it is absurd in the extreme to think for a moment that any commercial use could be made of these from the iron point of view. An early analysis of a brown hematite, otherwise limonite, is recorded from Moonee Ponds as containing 50-68 per cent iron. Such an analysis would seem to point to an ore of some value and here a point might be made out about the difference between a mineral record and a record of workable quantities of an ore.

Royal Park overlooks Moonee Valley and the origin of this name as well as Moonee Ponds may be worth a few thoughts. If you take the trouble to examine some of Mr. Hoddle's earliest maps of this area you will find that J. Mooney owned property adjoining this valley not very far from the present Moonee Valley Racecourse, and I was always familiar with the fact that this valley was called and locally known as Mooney's chain of Ponds, a very apt description of the ordinary condition of this creek. In several works already published about place names in Victoria, this origin appears to have been unknown, and a very trivial one given in its place.

Geology

This locality may be reached by the Essendon electric tram from Elizabeth Street to Flemington Bridge, or by train from Flinders Street to Flemington Bridge railway station. Proceed easterly towards the Royal Park and the cutting and other excavations and infillings will be reached in a few hundred yards.

I have memories of an old almost effaced quarry on the northern slope from the present Royal Park railway cutting overlooking the Moonee Valley which could have been in the closer-grained ferruginous sandstones of the upper beds of this area.

Mr. J. G. Knight, one of Melbourne's early architects, in 1859, stated, "Several buildings were raised with a sandstone principally obtained from a quarry on the Saltwater River, near the Melbourne Racecourse". St. James' Cathedral originally on the block of land between Collins Street and Little Collins Street adjoining William Street, had its foundation stone laid on the 9th November, 1839. "The whole building was ultimately of the ugly brown stone" was the description given by a later author. The Racecourse in 1839 was on the flat between Batman's Hill and the present position of the North Melbourne Railway Station, and was approximately parallel to the Saltwater River and no great distance from it, for there was only the Swamp intervening. I have no doubt that this old quarry supplied the stone of which St. James' Cathedral was built; it may also have supplied some, if not all the stone for the Melbourne gaol in Russell Street in 1840, which building commenced in 1841, though it was described as not opening for business until 1st January, 1845. There can be no question about the durability of this stone, although opinions may vary about its colour and architectural effect, its resistance to weathering can still be studied in situ, and the facts that the old cathedral has been pulled down and re-erected elsewhere, and some of the gaol wall blocks have been transported to St. Kilda foreshore to fight against marine erosion, surely speak volumes about a good building stone. Other quarries in this stone were near Glass's place and on the other side of the Mount Alexander Road, south of Madden's old home.

It is the railway cutting through the crest of the valley slope that has opened up much of our more ancient history, therefore I would like in this place to record the following particulars about the railway work:—

1882	Single line — Melbourne to Coburg.
1885-86	Melbourne to Clifton Hill. Opened 8th May, 1888.
1887-88	March 1887 to December 1888. Line duplicated. Excavated material used to build up the gravitation yards between Spencer St. and North Melbourne.

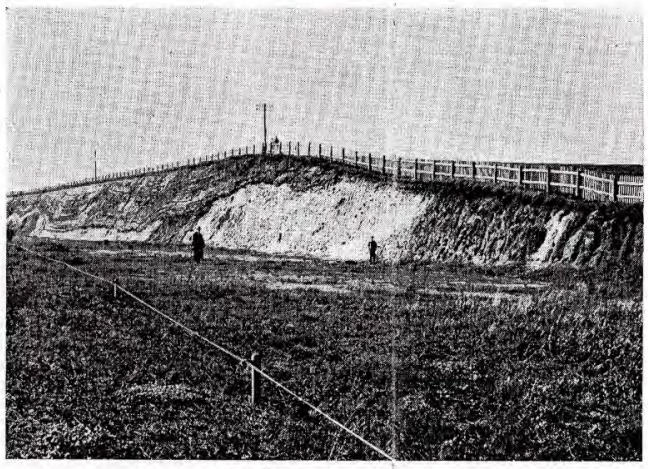


Plate 1

Royal Park Railway Cutting from West end, shortly after widening.

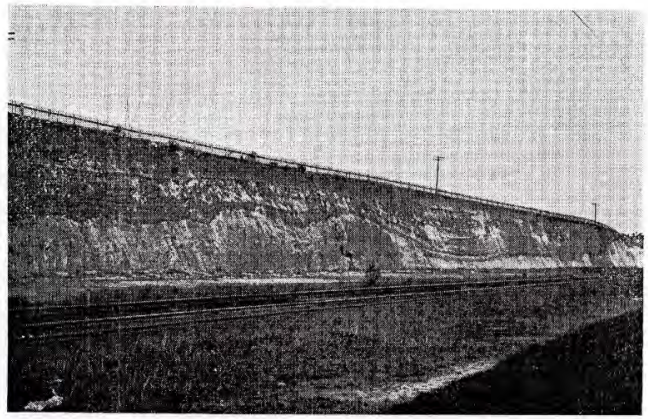


Plate 2

Royal Park Railway Cutting from East end, about 1900, shortly after widening.

This railway cutting through the Royal Park, a little to the east of Flemington Bridge, is, perhaps, one of the best known and most frequented localities by collectors and school and University classes in Melbourne. This, no doubt, is primarily on account of the ease with which many interesting fossils may be gathered from certain of the beds. Nearly every beginner in geology makes a collection of these Royal Park fossils, as they are of such a type as will readily appeal to anyone at the outset of his studies in this subject. The fossils obtainable here, however, have to be studied and pieced together with the utmost caution, for their usual form is but that of the hardened mud which filled the interiors of various animal remains, or an impression of the exterior markings or sculpture of these remains. The important part of the fossil to the popular imagination is the hardened mud or fine sand which filled the interior of these shells and other organic remains; but, in reality, that which is usually of most value to the expert is the impression of the external characters, though it is often necessary to have internal characters as well.

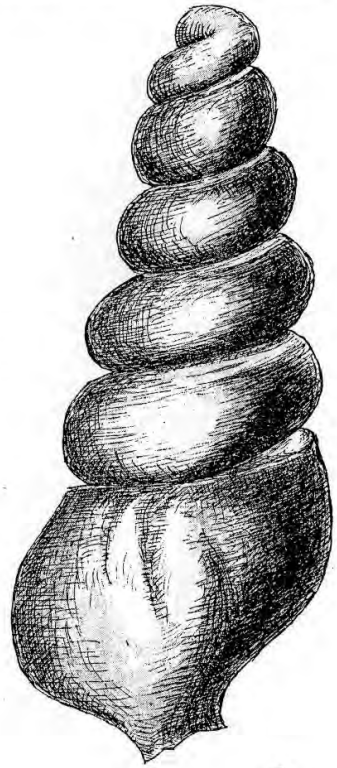
Collectors of fossils at this locality should, therefore bear in mind, the importance of taking every care to preserve the external sculpturing of the various remains found, as well as the more easily collected casts. Casts, at the best, may be regarded as somewhat unsatisfactory; but, when they are the only remains available, full collections may usually be made to yield a fair amount of the episodes of the past, and they must on no account be entirely overlooked or ignored, for in careful hands their story is a true one, and should receive the attention which is its due. The mere collecting of fossils at this locality may not seem to be of much use, but careless and indiscriminate collecting will at this section, be attended by many misleading conclusions, and if carried to extremes may even be regarded as throwing some doubt on the practical utility of fossils. Therefore each collector should be warned to keep a proper record of the particular bed or level in the cutting from which his specimens were obtained. Under these circumstances every collection is of the highest value, and may add considerably to our knowledge of the life forms which once existed in this region. This cutting, then, apparently so simple, contains a number of complex and rather difficult problems, and if the whole of

the facts available are not taken in conjunction with one another, very misleading views may be adopted.

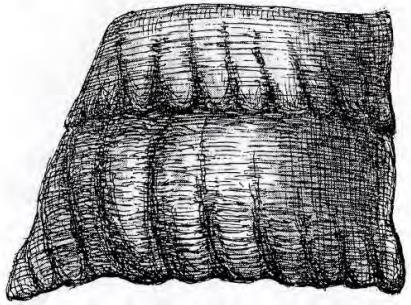
There is evidence in this cutting of at least four sets of conditions: *First*, a very small outcrop of the bed-rock or oldest rock of the Melbourne district, which outcropped at the south-western end at about the level of the rails at one time, but is now masked by material which has washed down from above. This was a stratified series of mudstones and shales which were not known to be fossiliferous at this outcrop. If we pass for a moment to the northern slope of the valley side falling away from the cutting and overlooking the Moonee Valley, recent excavations started in 1937, will be found that will well repay examination.

The work on this slope was carried out to supply material for filling up and levelling off a new playing field for this area, but the recent war prevented the completion of the job. Here a fine face of the Silurian sediment is exposed some 25 feet in height by some chains in length with a dip of from 17 to 25 degrees (now wholly covered by a stone wall — Ed.).

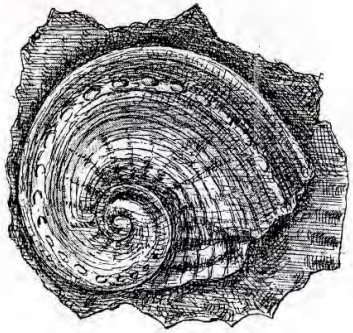
These sediments have already yielded more than one species of *Monograptus*, crinoids probably fragments of *Helicocrinus*, *Lingulella* and



1



2



3

other Brachiopods, *Keilorites* and other worm burrows and tracks. Digressing a little further over to the north in the Moonee Valley on the other side of Ormond Road, the mudstone and sandstones are very rich in fossil remains. These remains enable us to fix the age as Upper Silurian, or as this series is typically developed in the Melbourne area, the term Melbournian is applied to it as a sub-divisional name for a portion of Silurian time as developed in this part of the world. Again, these remains give conclusive evidence of a marine origin for these rocks.

Another important point that has been exposed by this new cut is a patch of leaf-bed clay with ironstone concretions overlying the decomposed remnants of the older Basalt. This was formerly masked entirely by hill slip rubble and soil. It can be seen here to contain plant remains. An exceptionally valuable piece of evidence has also been found here in the topmost layer of the ironstone concretionary bed in the presence of marine shell impressions, perfect and fragmentary of a species of *Nuculana*. On careful examination the *Nuculana* proves to be *N. acinaciformis* Tate and associated with it is the gastropod *Leiopyrga quadricingulata* Tate. This would indicate a Kalimnan age for the ironstone beds and is discussed below in more detail. The old Silurian rocks, after they had been raised above sea-level must have been subjected to the various actions of many denuding agents through vasts periods of time, for we find the surface of the rocks levelled off, cut into, and hollowed out, over considerable areas. Into some of the deepest of these hollows lake conditions developed which permitted of the accumulation of gravels, grits, sands, clays and vegetable mat-

Plate 3 ◀ Some characteristic Royal Park Fossils—

1. *Cerithium flemingtonense* McCoy (Internal mould).
2. *Cerithium flemingtonense* (enlarged external sculpture)
3. *Haliotis naerosoides* McCoy (Internal mould).

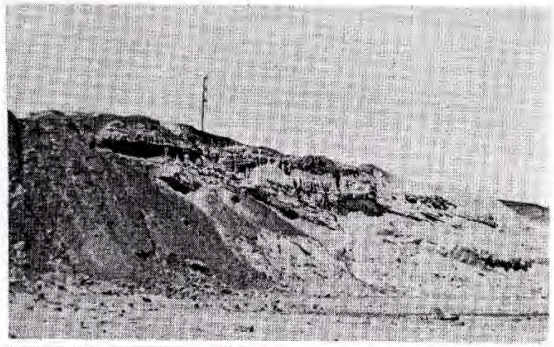
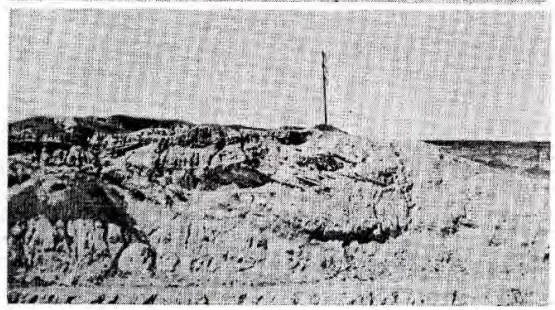


Plate 4 ▶

Excavations (1937) on north side of Railway Cutting.



ter. Leaf impressions can be found in the finer sands and clays. As subsequent developments in these beds, ferruginous concretions, as well as siliceous concretions in the form of flint or chert can be found. These leaf-beds, from an examination of their plant remains and stratigraphical position, would appear to be of very early Tertiary or Cainozoic age. The equivalent of these beds instead of only carrying plant impressions, in some places carry beds of lignite and even considerable and valuable thicknesses of brown coal. This lacustrine or old lake series is missing from the section as exposed in the Royal Park, but up a small gully that runs past the Zoo and Mount Royal, and at the west end of Sutton Street, North Melbourne, outcrops can now be examined, and leaf-bed evidence collected. South from Royal Park and running from St. Kilda to Williamstown, Altona Bay and Werribee, may be seen the other aspect of this series in an important Brown Coal deposit yet to be fully exploited. So here is one little leaf of past history that can be reasonably intercalated with the particulars of Royal Park Cutting.

The *second* set of conditions to which attention may be drawn is in the interpretation of the several humps of a clay-like material to be seen at intervals along the banks of the section. It does not require a very detailed examination to show that this material is the result of the very complete decomposition of some rock. The isolation of the various knobs shows that its old surface has undergone a great amount of erosion, and at the west end of the section the original character of this rock can still be made out. It was, in fact, once a basalt, and every stage in its decomposition, from the hard, compact undecomposed cores, through the successive layers of the spheroidal weathering, to the completely altered rock, is still here; but in the northern side of the cutting much better examples of this rock in its undecomposed state can be collected, and though at first it may seem hard to believe that such a rock could be capable of such marked changes, the successive stages are so easy to follow that no one can have any reasonable doubt about the matter.

These basaltic rocks vary quite a lot in texture, and though usually holocrystalline the minerals are so fine as not to be detected by the unaided eye. The characteristic minerals present are a strongly basic felspar, that is, one rich in lime and ferromagnesian silicates such as augite and olivine, but the latter varies quite a lot in amount sometimes being rather scarce while at others it is quite abundant.

BASALT COMPOSITION

Plagioclase Felspar

1. Oligoclase — Silicate of Alumina, Lime and Soda.
   $3Na_2O, CaO, 4Al_2O_3(SiO_2)_{20}$.

Ferro-Magnesian Mineral

2. Augite — Lime, Magnesia, Iron, Silicate often with Alumina, Soda or Potash.
   RO, SiO_2.
3. Olivine — Magnesia, Iron, Silicate.
   $2(MgO, FeO), SiO_2$.
4. Magnetite — Oxide of Iron.
   Fe_3O_4

Or some form of Titaniferous Oxide of Iron such as Ilmenite.

The chief mineral in this rock being a soda-lime felspar, the soda and the lime is the weak part and it will be attacked by natural waters carrying carbon dioxide. This acid attack will form sodium carbonate and calcium carbonate which may be carried away in solution. Then hydration plays its part on the silicate of alumina, adding water to it and corroding it into clay; but under some conditions the alumina and the silica are hydrated separately giving rise to bauxites on the one hand, and opaline minerals such as hyolite, opal and opal jasper on the other.

Then the chemical breakdown of the ferromagnesian mineral is just as important, and as this usually is augite, a more or less complicated silicate which may be expressed by the general formula — RO, SiO_2, where R is the lime, magnesia and iron, or it may take the general formula, RO, R_2O_3, SiO_2 where there is alumina in addition. Here one of the most noticeable points is the hydration and oxidation of the iron making limonite or some allied form, and this stains or discolours the rock, concentrates along the natural cracks, and on the outside of the surface blocks or boulders. To this burnt appearance the popular imagination immediately applies the idea of an original molten mass but the view and reasoning are bad, as it is really evidence of the chemical breakdown of a mineral. The lime and magnesia are converted to carbonate, sometimes to exist separately as calcite and magnesite, sometimes together as dolomite; and again the residue may become clay or different hydrates.

The olivine is likewise due to lose its iron as oxide or hydrated oxide or possibly even to some extent carbonate, which the silicate of magnesia becomes hydrated and is often responsible for the greasy feel to be noticed in decomposed basaltic remains. The magnetic oxide of iron, especially if titaniferous remains unchanged, and may give rise to black iron sands so common in the wash from basaltic country, but under some conditions the magnetite may convert to hematite and give rise to red ochre deposits when associated with clay.

Thus the rock may be entirely changed and numerous new minerals formed some of which are carried away in solution to be deposited elsewhere later and some of which remain behind in the position of the rock.

The products of decomposition most frequently noticed will be—clays limonite, hematite, bauxite, impure limestone or travestine, magnesian limestone and when the iron oxides become rather more concentrated, laterite. Then the drainage from the decomposed parts may precipitate in suitable cavities in the decomposed rock such minerals as — calcite, ferrocalcite, arragonite, magnesite, or some of the group of minerals known as zeolites, including such as—chabazite, phacolite, phillipsite, mesolite, analcite, and others. The sediment derived from a basaltic area is clayey, so that only argillaceous rocks would be derived in this case. The soils of basaltic areas are well known clay soils, notably disagreeable when wet, very tenaceous and retentive of moisture, and liable to become water-logged.

These soils are often referred to as Volcanic soils and are much sought after from the agricultural point of view on account of their richness. They may be red or chocolate from oxide of iron colouring, they may be black from vegetable or other organic matter, or they may be grey in colour. They evidently still contain some soluable mineral matter, as well as other conditions suitable for the sustenance of plant life.

Note the rich potato and onion soils of Port Arlington and Bellarine which have been derived from the decomposition of the "Older Basalt" of those localities.

The age of this old Tertiary lava flow must be very great indeed for on its weathered and worn surface it has a marine deposit of Balcombian Age (Middle Miocene). Underlying it

there are very old Tertiary leaf beds as well as older marine Tertiary sediments. The thickness of this old basalt in this section is now only very trifling and very variable, but as it is undoubtedly a part of the same old lava flow which extends up to Broadmeadows and forms the core of the Kensington and Newmarket ridge to the west and extends to Keilor and forms the North Melbourne hill the high land of West Melbourne and South Melbourne, it is obviously only a small remnant of a very considerable lava flow. This is known as the "Older Basalt" in Victoria, and as to the period of its outpouring the sections under consideration help to some extent to fix its antiquity. The immediately overlying Balcombian sediment contain angular and subangular fragments of decomposed "Older Basalt". Thus we reach the *third* set of conditions in this section representing the thin edge of a marine series. Resting in the hollows of the eroded surface of this old lava flow there are deposits of coarse grit and sand and clay, with the top bed of a foot or so in thickness of sandy and gritty material, cemented with oxide of iron usually of a red ochreous character. These upper cemented layers are apparently inseparable from the white beds immediately underlying as the surface of contact is very irregular; the binding iron oxide penetrating to different depths, is apparently due to the rather more porous character of the upper sands, and when the lower clays or sandy clays were reached, free percolation of the iron solutions would be checked or entirely stopped. This appears to be the most feasible explanation for the striking difference and irregularity seen. As everyone knows, who has collected fossils at this locality, it is from this red ochre seam that the best fossils may be obtained, and the staining of hands and clothes of those who have been at all energetic in working in these beds is quite a familiar feature.

On one occasion whilst collecting fossils from the lowest ferruginous band I picked up a specimen of a bivalve shell, known under the name of *Dosinia johnstoni*, which had evidently been washed down from some of the overlying beds, as judged by the character of the matrix with which it was associated. The whole of the calcareous matter of the shell had been washed out, and a complete pseudomorph of limonite had taken its place. Now, this shell is elsewhere a characteristic late Miocene to Pliocene species and its discovery gave the first hint of the possibility of the existence of two sets of beds amongst these sediments. Following up this clue it was found that the characteristic Middle Miocene or Balcombian fossils were confined to the lowest bed of a foot or so in thickness. Above this level, though fossils are much scarcer, only Upper Miocene-Pliocene forms are obtainable. The material of which these upper beds consists varies from a coarse quartz gravel to very fine sand, with a large proportion of clay. The lowest layers of this series are usually well cemented by limonite, but towards the top of the section this ferruginous cement occurs in a very patchy, irregular, and concretionary form. In many places near the top there is the appearance, as if the ferruginous cement had been removed, but it is often found that the patches deficient in iron oxide are distinctly composed of clay, and it is well known that when clay becomes wet it acts as a very efficient check to free percolation, and, consequently, it would seem reasonable to say that these upper patches, which are now devoid of ferruginous cement, were always in that

condition, rather than that it should have been subsequently removed from such a type of material.

Thus the *fourth* set of conditions presents itself. Fossils are comparatively scarce in these upper beds, and no doubt many have been entirely removed owing to the highly porous character of the sediments. It is only in the finer bands, and patches of limonitic sandstone, that there is a reasonable hope of finding these all-important remains, and when a series of these is once obtained, it requires little more than a glance to satisfy anyone that there is evidence of the existence of two distinct faunas in this section. The impressions of fossil leaves and fruits are also recorded from this locality, and this, taken in conjunction with the coarseness of the sediments and the character of the marine shells associated with them, is very clear evidence of the littoral or shore-line character of these deposits. In the first place, then, fossils pointed to the necessity for discrimination between these beds; in the second place, the lithological characters, the nature and arrangement of the sediments and the Hematitic cement, marks off in a distinctive manner, the highly fossiliferous band of the lower beds from the more limonitic beds above; and thirdly, there is the stratigraphical evidence of an unconformity, in the form of an overlap, for the lower beds with their characteristic fossils do not rise over the bosses of decomposed volcanic rock, but lie in its eroded hollows, while the upper series have not only completed the infilling of these hollows, but completely overlap the older series, contacting the "Older Basalt" as well as the Silurian, and thus cover a much more extended superficial area in the Melbourne district than the Balcombian deposits.

The Railway cutting measures twenty-one chains in length, and in this distance there is a very heavy rise to the east, as may be gauged by the difficulties of heavily laden trains which have to negotiate this part of the track. The cutting is made on the curve, and the southern face is cut back on a considerable slope, so every care must be taken in the determination of the true thickness of the beds exposed, for, as the section is exposed, each bed appears to be of a slightly greater thickness than its true thick-

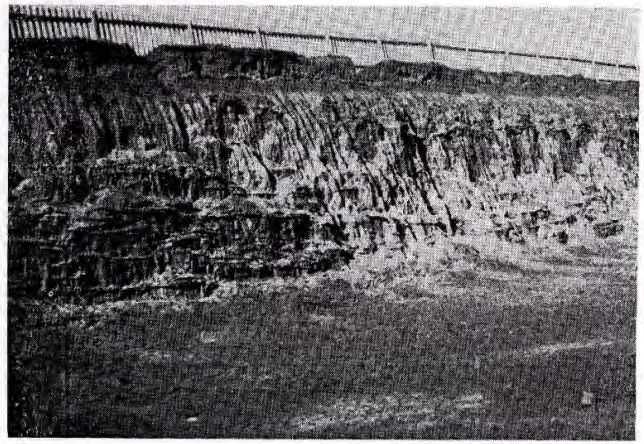


Plate 5

Characteristic weathering of Tertiary rocks, Royal Park Railway Cutting, east end.

ness. If you turn to the northern side of the cutting there will be a better opportunity of examining the geological section, for here the side cutting is practically vertical, and as we are dealing mainly with horizontal, or nearly horizontal beds, there is no exaggeration of thicknesses, nor obscurity of relationships.

In this section the lithological differences between the lower beds (Balcombian) and the Upper beds (Kalimnan) are well marked, but the hematitic band is more extensive, as it ranges along almost the whole length of the cutting and drops down to rail level to the east owing to the steep grade of the floor. This bed is very full of fossils and will always well repay anyone who may care to investigate its contents. The Balcombian band is comfortably accessible, but fortunately the Kalimnan beds are out of reach, and it is thus possible for any student to collect from the northern side without fear of obtaining a mixed fauna — a state of affairs which might easily happen by indiscriminate work on the southern face. It will be clear, therefore, that we can fall back on our examination of the northern side to prove the interpretations of the southern. Further points may also be obtained on the "Older Basalt" and the mode of deposition of the successive shore-line accumulations of Balcombian, and subsequently of Kalimnan times.

Fossil collecting at Royal Park may yield evidence in many directions, *First*, it will show us the remains of invertebrate creatures ranging from the lowest to the highest forms of life, starting with the foraminifera, passing through the sponges, corals, sea-eggs or sea-urchins, lace corallines, lampshells, bivalves, univalves and higher mollusca of the nautilus type.

Second, shallow water or shore-line conditions are indicated by the numerous fragmentary remains as well as the presence of such forms as limpets, mutton-fish-shells and the common long spirals, cones, whelks and periwinkles. *Third*, these fossil remains are all extinct and very ancient, even though some may at first sight appear very similar to living forms. Thus the age of rocks can be fixed, the conditions under which the rocks were deposited, and the types of animal life which existed at the time.

Then as evidence of further subsidence of this area (after Balcombian) there is the definitely overlapping marine Kalimnan series with its distinct suite of fossils and the presence of leaves, fruits and logs showing the nearness of the old land.

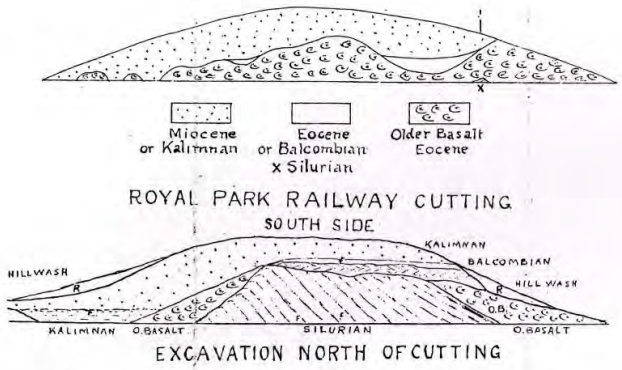


Fig. 2 — Sections shown in Royal Park Railway Cutting.

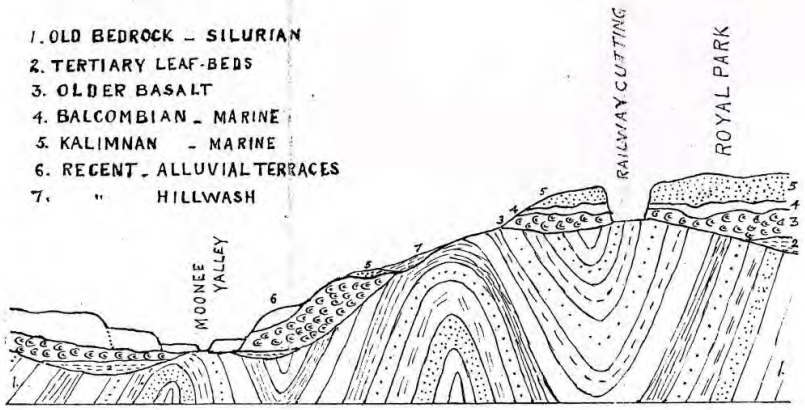


Fig. 3 — Diagrammatic Section, Royal Park.

F.N.C.V. PUBLICATIONS AVAILABLE FOR PURCHASE

THE WILD FLOWERS OF THE WILSON'S PROMONTORY NATIONAL PARK, by J. Ros Garnet.

9 Colored Plates. 32 Black and White Plates. 150 Drawings. A Check List of 854 Plants. 192 Pages. $4.75. Postage 30c.

THE VEGETATION OF WYPERFELD NATIONAL PARK, by J. Ros Garnet.

Colored Frontispiece. 23 Half-tone Plates. 100 Line Drawings of Plants. Map of Park. 96 Pages. $1.50. Postage 20c.

VICTORIAN TOADSTOOLS AND MUSHROOMS, by J. H. Willis.

4 Colored Plates. 31 Black and White Plates. 120 Species described. 88 Pages. 90c. Postage 20c.

BIRDS OF THE DANDENONGS, by W. Roy Wheeler.

9 Colored Plates. Map of Area. 52 Pages. A Check List and description of 211 Species listed for the Area. 75c. Postage 20c.

To ensure prompt delivery, order direct from

Sales Officer F.N.C.V.
129 Waverley Road, East Malvern, 3145.
Telephone: 211-2427.