Cover

Western Dist. – Vict..

ON HIS MAJESTY'S SERVICE

Geological Notebook No. 9

National Museum of Victoria,

Melbourne, C.I,

Victoria, Australia

Edmund D Gill

Title page

Notebook No. 9

If found please return to – Edmund D Gill

Palaeontologist

National Museum

Russell Street

Melbourne CI.

1951

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Page 1

Lake Colongulac

Present (Mar. 1951) time of "drought" but still water in lake although low. In wet time (e.g. Mar. 1946) water up to edge of grass.

In 30 years advance of lake lessened through accumulation of loess. Areas raised 2'-2'6" by setting levees etc. to collect it. Thus cows now feed where 30 yrs ago the children tied up their canoe.

On Jan. 18th 1930 the lake had been dry for 30 days and the loess had banked up 3' on the wire netting fences but the rain washed it away into the lake.

Changing winds – important in evaporation, because the wind on turning drives the water back

Page 2

over dry areas where much is lost by soakage. At the same time the wet lake bed is exposed at the windward end and dried up. Alternating winds dry up the lake quicker than anything.

Mr P. Law-Smith Senr. who has lived at "Chocolyn" for 31 years, says when he came there, the point at the S. end of the lake was an island, but since then loess has filled in between the island & the shore. Suggests rather drier in past 100 yrs or so than previously.

When the lake bed is dry it is white & shiny due apparently to the presence of salt.

March is the calmest month.

Page 3

Bore 190

"Chocolyn" House bore S side of house near gate to house & gardens

Table showing strata in bore

Bores by Southern States Drilling Co. Site of house bore 40' above lake floor therefore cliff in basalt under loess. Water rises in bore to 41' when no pumping. When yielding 1300 g.p.h. maintains 56'.

Page 4

Bores 191-192

"Chocolyn" dam bores

Table showing strata in west and east bores

Bores 125 yds apart.

Both maintain level at 15' when no pumping.

Page 5

In "Chocolyn" bores NB

1. No tuff

2. Black podsolic soil or loam developed on loess as seen well at lakeside. This indicative of change of climatic conditions.

3. "Yellow clay – very stiff" of bore log is no doubt loess. Where found wet in excavation is very stiff & of clayey consistency.

4. Note this deposit thicker on east side of dam i.e. of a creek bed in which the dam formed.

5. Repeated basalt flows (3) – gravel beds.

Page 6

Diagram of basalt boulder used for grinding

Basalt boulder with two grind-mill holes in it found in “Chocolyn” & presented to Museum by Mr. Law-Smith Jnr. Mill stone (round) to go with above forwarded later.

Page 7

Notes on Lake Colongulac levels from records kept on the property for 30 years by Mr P. Law-Smith Senr.

Date	Cond. Of Lake
March 1, 1923	Dry
26/5/23	Started filling
4/3/27	Dry
27/12/27	Dry again
16/2/28	1/3 full
27/2/28	Dry again
1/12/28	Dry
27/12/29	Dry
31/5/30	Dry
1/7/30	Still dry
1/1/31	¾ full
28/2/31	Yet by 28th Feb. dry & some water on March 2nd.
16/3/31	Dry again
29/12/31	Very full

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26/11/33	Water blowing up & down lake
29/12/33	Dry
1/3/35	Dry
18/3/35	Began refill
1/11/35	Very full
18/1/38	Dry
26/10/38	Dry

15/12/40 Dry

28/10/41 Very full

15/1/45 Dry

7/7/45 Began refill Water in lake till present. About ½ full when worked there 10/3/51.

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Analyses of water (by Avery & Anderson) from bores at “Chocolyn” E side of Lake Colongulac

Table showing chemical analyses for house bore and west dam bore

See p. 10

Photo of cliff along lake shore

Note loess (& alluv therefrom) defined by thistles

Page 10

SE corner, Lake Colongulac

Diagram of tuff cliffs along lake shore

1. The occurrence of loess near the old lake floor just N of the tuff cliffs shows that the loess was piled against cliffs of tuff cut by former lake.

2. The increase in cliff height & the change of direction support this observation.

Loess therefore younger than tuff. Lake cut cliff in tuff. Dried up & loess formed. Than later lake eroded both tuff & loess.

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Diagram of cross section of loess cliff with auger hole

Auger hole c 200 yds N of windmill on previous page (10), E bank of Lake Colongulac

5” black alluvium

3’3”+ greyish silt with pebbles of ?loess & ?tuff

Abandoned as had to keep appointment.

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Loess Cliffs

1. Where loess highest is where basaltic points occur.

2. Loess also projects further into lake at basaltic points.

3. Where basalt higher (near “Chocolyn”) projection greater.

4. Loess piled up against basaltic cliff or eminence as shown by house bore at “Chocolyn”.

5. Thus accumulation of loess due to presence of obstacles. Notes on p.2 show how this so in present cycle.

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Camperdown

Lismore Rd. ½ mile N of railway line SEC poles bring up basalt.

Leura St (Same Rd cont’d S.) For 1 ml S of Princes Highway SEC posts bring up basalt (as far as school). Mr Law-Smith says limestone comes up near there

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19/1/52

5’ Basalt

1’ hard brick-red solid, siliceous material with fine veins of lime fr. Basalt

1’6” of mottled red & dirty yellow siliceous material merging into limonite-yellow material (3”).

5” grey silty clay.

2” whitish “limestone”

(7/7/53 Analysis by A.W. Beasley shows as suspected that this material is magnesite no doubt derived from the weathering of the basalt above).

No fossils macro or micro.

Page 14

7/2/51 Winchelsea

Princes Highway

Road cutting 64.65 mls W of Melbourne, 6 1/2 mls W of Mt. Moriac, 3.99 mls E of Barwon River at Winchelsea.

5’ Partly decomposed basalt. Flow structures (elongated vesicles, etc) in base parallel to former land surface i.e. 10^{o} W.

1’6” Bright red soil with iron nodules. Sometimes grey patches immediately under basalt. Not free of quartz.

1’1” Yellowish & reddish soil also in places greyish & reddish – more reddish at top (oxidized from above?)

3” yellowish or yellowish brown iron-rich zone with stringers of lime. In places limestone 2” thick (under iron).

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6” light grey then

1’0” reddish or brownish clay, sand or gravel

20’+ whitish, yellowish, brownish & reddish clayey sands & gravels.

Current bedding very regular.

Diagram of podsol soil (contemporary) on top of sloping beds of basalt, laterite, & bedrock alike, but thinner over the basalt.

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19/1/52

Discussion with Leeper

1. Laterized top red-bed suggests warm & wet climate

2. Succession not such as find in a soil, therefore history apparently

1. Tertiary sand or gravels

2. Fluviatile, Lacustrine or swamp sandy clays.

3. Drained & “lateritized”

4. Basalt covered

5. Inclined by tectonic movement.

July 1959 Now regard these as up. Miocene &/or Pliocene non-marine beds. Either up. Mio. lateritized & lateritic iron eroded off leaving mottled zone or Pliocene beds like Red Bluff Formation

Feb. 1961 Acicular aragonite in basalt

Page 17

Warrnambool

Sewerage Outlet

Map of location of sewerage outlet and Bench Mark 91

This City of Warrnambool survey found later to be grossly in error. Outer edge of platform c 0.5’ above mean LW

Difference in level between

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height attributed (apparently by eye) to the shore platform & the surveyed height of the outer edge (5.5') is due to the difference between the tides in Lady Bay where LWM fixed & on the open coast. But with greater tidal range level should be lower.

Floor level Dennington State School 59.51'

B.M. Deck spike cnr post NW corner of Lindsay & Baynes St., Dennington 53.31'

B.M. Deck spike in split post SW corner of The Esplanade & Baynes St., Dennington 15.01'

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28/2/51

Dennington

Floor of Nestle's new boiler house 4' above sand

Diagram of Excavation 1 showing tuff layer over sand and shells

Excav. began beside rly line where tuff already excavated c 3'.

Engineer said shells from excav. appeared thicker & bigger if anything than shells to be seen now on the beach.

Melb. Datum LWM & tidal range 2.8'

MSL therefore approx.. 19.98 + 1.4=21.4 ft.

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28/2/51

Flight of levels from Dennington Railway Station, NE rail top, opposite arrow & just over 169 mile post

= 38.34' on Melbourne Railway datum

From there to boiler room at Nestle's, then to B.M. at S end of The Esplanade.

= 15.01 on Warrnambool breakwater datum.

Then to Moulden's Quarry where iron peg placed on top of aeolianite platform (N end of quarry).

Pages 21 and 22

Table of survey data for Dennington and Mouldens Quarry

Page 23

Moulden's Quarry Dennington

C 30' "littorite" (field term for shoreline deposits = shallow marine & beach as against dune deposits) then loose sand above. Surface of Travertine covered by brownish black apparently tuffaceous soil. Eg. Section SE corner.

Diagram of soil layers at SE corner of quarry.

Page 24

Compare the red soil

1. In auger holes at foot of Cannon Hill.

2. Under tuff in road cutting between Dennington and Illowa.

3. Under the tuff at ~~Cannon Hill~~ Thunder Point.

In Moulden's Quarry also ~~tuffaceous~~ travertine. Check by Dr. A.W. Beasley showed plentiful tuff minerals.

July 1961.

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Auger hole No. 1 of Dennington Section 100yds S of Moulden's Quarry

Diagram of layers encountered during augering

Top of aeolianite 14.81' above LWM

Datum found to be undependable. This platform may be a 4m one.

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Pages 27 to 36

Flight of levels from iron peg in platform at Mouden's Q. to coast

Section line from Quarry to Sanitary Depot windmill & to shore

Table showing flight of survey levels from Iron Peg to the beach

Page 37

(No. 2 of Dennington Section)

Excavation on flats SE of Moulden's Q. Dennington

Diagram showing location of Moulden's Quarry and various auger holes

Page 38

Diagram of Excavation No. 2 vertical profile

Platform 8.01' above LWM Lady Bay.

Not marine deposit. Or origin like marine shells in Lake Pertobe auger holes.

Page 39

(No. 3 of Dennington Section)

Excavation ½ way across flats from Moulden's Q to Merri River

Diagram: vertical section of this excavation

Page 40

(No. 2 of Dennington Section)

Auger hole, N. bank Merri River

(On section line from Moulden's Q. to Sanitary Depot windmill

Diagram: vertical section for auger hole

Page 41 and 42

(No. 3 of Dennington Section) 9/3/51

Auger Hole S edge Swamp on Section Line – near Sanitary Depot

Diagram: vertical profile of auger hole

Old course of the Merri River (when flowed directly south cf valley on continental shell) incised during low sea levels & infilled during Flandrian Transgression with freshwater sediments and fossils as base level rose. Still water facies.

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Auger holes 20.4.51

A. (see p.37) 0"-2'3" Black alluvium w swamp shells & frags marine shells Tuffaceous

Small diagram showing location of auger hole in relation to a fence

2’3”-3’8” Grey muddy sand with marine shells w.h. not plentiful but includes those with 2 valves together (Tellina sand shells)

3’8” Solid rock

Sample 2’3”-3’. Lights mostly quartz. Some woody & peaty material.

(a) opaques. In heavy fraction, iron sulphide abundant, also black iron ores (ilmenite & magnetite). White leucoxene from alteration of ilmenite

(b) Transparent particles mostly rounded. Garnet few, tourmaline few, zircon few. Only 2 rounded grains of olivine seen, but hackly olivines common higher in section. Pre-Tower Hill Tuff

C. (p.37) 0”-10” Dark-grey alluvium w swamp shells & some marine shell fragments

10”-21” Mid-grey muddy sand & marine shells.

21” Aeolianite

Same site as p. 38

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B. Near site p.38 but nearer fence of swamp.

0”-21” Dark grey alluvium with marine shells from first (eroding emerged bed, or beach?)

21”-26” Mid-grey muddy sand with marine shells

26” Aeolianite

Sample 0”-12” Heavy fraction with granitic & basaltic minerals zircon, tourmaline, rutile, iron-ore minerals etc. Angular augite & hackly olivine grains. Fine & even-grained light fraction (mostly quartz) bec. derived from marine bed. Charcoal pres.

12”-21” similar but less charcoal.

21”-26” marine sediments. Fine & even-grained charcoal & volcanic minerals washed in?

D. From C to swamp fence & draw line & take point 2/3 ch. From fence

0”-14” Alluvium

14”- Grey muddy sand with marine shells

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Dunes

In vicinity of Sanitary Depot S of Dennington

Diagram of dune cross section showing vegetation change

1. The dunes are not even like desert dunes but hummocky.

2. Lower ridges in front noted all round coast Expression of more recent sand movement?

3. Dunes mobile on whole. See above for vegetation zones

4. Blowouts in places. These

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appear to continue until local supply of sand used up. Later whole structure may be fixed by grass again. Supply of sand thus a limiting factor.

5. Rhizoconcretions also concretions (see photos) on solution pipe principle (due to water running through) but solid cf. sand stalagmites. These commonly formed & destroyed again – a source of breccia.

Page 47

Tower Hill Beach

Flat on inland side of sand ridges & N of Gorman's Lane consists of

Diagram of flat inland of Tower Hill beach

1. (Track hard & bumpy in this area) Local development because not found in section along Gorman's Lane or nearer Merri Cutting.

2. Sedimentation of sand by water because fine crossbedding of the whole more or less horizontal. Temporary Merri channel filled with sand, or a

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function of freshwater &/or sea flooding.

3. Travertine crust by seasonal wetting & drying? Most of concretioning effects in dunes a function of rain water. [Incipient concretionary pillars found on S side Merri ctg after rain (photo)]

Numerous sand stalagmite effects

Diagram (unlabelled) – not identified

4. Travertine very recent. Since Tower Hill vulcanism, & since sand ridge formed because occupies flat behind it

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The sand hasn't a slope as on a beach

5. Travertine therefore many modes of origin

(a) As pan under soil (Crocker) Freshwater

(b) Rind on foreshore due to seawater (Hills)

(c) As above

6. Travertine therefore many ages

(a) Probably all Pleistocene interglacials.

(b) Continuously on coast.

(c) Wherever conditions as at Tower Hill beach.

Photo of Goose Lagoon

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Five Photos of Goose Lagoon (only one with annotation)

Page 51

Goose Lagoon

Auger Hole c 3 chs N of highway & half way between “island” of aeolianite & E bank i.e. what is undoubtedly the middle of the main stream.

Diagram: vertical section of auger hole

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Mr. John MacNamara of “Boodcarra” (Private Bag Port Fairy is postal address) the property on the W side of the swamp & N side of highway, says a very dry year. Usually damp (swampy) all year round. Says peat has been on fire in at least two places – seen now as depressions.

Clay of lower bed ignites to reddish brown showing presence of iron. Washed in water, black humus floats off. Abundant fine rounded quartz, so is a sandy clay.

Page 53

Lake Gillear

S bank of drain at W end of the lake c 75 yards E of road. Section

Diagram of cross section of drain wall

Page 54

Auger Hole

Diagram: cross section of auger hole

Page 55

Port Fairy

“Littorite” section S side drain N boundary of town c 3 chs E of highway beside Mrs Watts’.

Diagram: sediment profile

Page 56

Solution pipes among the fallen debris. A number in E end of section figured on opposite page were photographed. Good deal of travertinization.

Ecology. Shells of bivalves generally separated. Commonly deposited at many angles. Cross-bedding & lens formation. Waters therefore not quiet.

Diagram: map of south beach and Moyne Rover showing outcrop of Holocene shell bed

Page 57

Holloway’s Beach

An emerged platform shown on the G.S.V. geologically coloured Parish Plan of Nelson as probably such. It would appear that the rock of the hill on the inland side of this structure is Pleistocene & not Miocene, but only examined in the vicinity of the border.

Vic/S.A. border c 1 ml 12 chs too far west. Supposed to be 141st parallel. Long in dispute. Privy Council decided in favour of Victoria.

Beach wide & consists of off-white sand, faintly grey in places. Levels begun at or about low tide, viz.

10:45 am 3/3/51

Sand largely calcareous; greyer shade when wet.

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Traverse run N.S., beach E-W. Remains of fence on section line where started on beach. Section line cuts into bends of track from highway to beach. Section about ½ way between end of track & fenced bush area.

Investigation of Holloway’s Cave, outcrops along road into H’s beach, & on platform itself, show the bedrock to be “littorite” of considerable thickness. Most of the platform, its shells & boulders belong to the Pleistocene bedrock. Solution pipes through it. On top in places is a poorly consolidated aeolianite which is clearly more recent.

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Ridge of aeolianite near present beach shows the “fossil beach” may be an old estuary. If so belongs to 25’ or 10’ sea or both. The W spur of this ridge is passed over by the flight of levels & called Ridge 1. Ridges 2 & 3 are much lower as section line shows.

On day of levels fine except for a few misty showers. Slight S wind. Breakers about 5’ high.

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Pages 61, 62, 63, 64, 65 and 66

Table showing survey data for N.S. section from coast across Holloway’s (emerged) Beach

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3/3/51

Holloway’s Cave

Map of location of Holloway’s Cave

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Diagram - cross section of cave

Very generalized section. Cave c 40’ deep. Solution cave. Bones common.

Page 69

Note At this time found difficulty in distinguishing shallow marine, beach, back-beach, beach ridge, sand flat, blowout & such calcarenite facies, so devised the non- committal term “littorite” to cover this suite of coastal sediments.

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27/1/55

Warrnambool

At brass foundry of Mr. E. McDowell, E. side of Henna St. between Lava St & Raglan Pde. Bore to 96 ft. Hard band at 80’ diverted bore. This probably the hardened surface of the Miocene marine limestone which is an old sea floor & so probably indurated for about a foot. Travertinous land surface.

Bore 198

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Thunder Point

Warrnambool

18/4/51

Diagram: profile of tuff and soil layers over aeolianite

cf. p. 74

Photo of Tower Hill Beach.

This photo published Mankind 4(6):250 (1951)

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Tower Hill Beach

N end near Merri Cutting at site of midden from which bone implements, carbon for C14 tests, etc.

Diagram of dune profile showing soil horizons and a midden

At base of soil 2 midden shells dominated by Donax. Midden in 1 dominated by Turbo. Neither grow here now. Great increase in sand which

Page 73

Sweeps over shore platform of tuff & lapilli. Little or no life because sand shallow & moving; when platform bare not long enough to be colonized. Donax horizon suggests sand ecology nearby at time of soil 2.

Lower soil horizon 2 nearly horizontal – slight dip N so that disappears under beach sand. Lower S.L. then to get soil below H.W.M?

The 2 soil layers merge c. ¾ chain inland (W)

Austrosuccinea plentiful in upper dark grey sand but none found in lower layer.

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18/4/51

E. of Illowa

Road cutting in aeolianite on both sides of Princes Highway on top of hill 1.3 mls E of Illowa store corner (towards Dennington). Tuff preserved in hollow.

Section on S. side of road (cf p.71)

Diagram: road cutting cross section

In this hollow in aeolianite 7 solution pipes or parts thereof. None in higher aeolianite of cutting where 12’ of aeolianite exposed.

Similar succession with pipes At E end of ctg on N side of road. In ctg also older red soil layer in aeolianite.

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18/4/51

Goose Lagoon

Map of location of Goose Lagoon drain and midden

Diagram of Drain Section

Shells very worn mostly rock shells predominate. Here 25’ sea crashed on basalt ridge. Some shells whole. Some look very old & some very fresh.

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Apparently lagoonal conditions obtained on N (inland) side of basaltic barrier as only alluvium & peat there. Middens (probably shells taken out of wind) on N side of high aeolianite dune.

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Lake Colongulac

Datum for surveys. Lower basalt step of French window on drive (on landward side of house) at N.E. corner of “Chocolyn”.

Sketch map showing location of house on Lake

Plan of “Chocolyn” house showing datum point

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Diagram of basalt steps showing datum point

Flight of levels was taken from this step to the Lake via the house bore for which log is given on P. 3 & water analysis on P. 9.

Diagram: Plan of survey line

Pages 79 and 80

“Chocolyn” datum to shore or Lake Colongulac via water bore.

Table of “Chocolyn” survey data to shore or Lake Colongulac via water bore.

Page 81

Map of dam showing location of East and West windmills

Page 82

1 Level to E. mill 285° 08”

2 Level to W. mill 48° 45”

3 level to tankstand on hill 80° 55”

Line of levels taken by shots to both mills & then directly to lake parallel to fence & about 1 ½ chs from it.

There is a tendency to two terraces in the dolerite & these are noted in the levels on PP 83-84

Pages 83 and 84

Table of survey levels

Page 85

Augur hole near Law-Smith’s quarry from which came jaws of giant kangaroos.

Black soil to 9”

Loess to 4’10”

Red gravel in clay (old soil?) to 8’5”

(sticky to augur after powdery loess)

Solid red gravel (grating on auger) to 10’2”

Where basalt chipped.

Level

Back to BM 0.71 (tachy 1.66)

For’d towards hole 2.38

Back 5.92

For’d to hole 0.20

i.e. top of hole is 4.05’ above B.M. = 16.03’ above water.

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Therefore top of red gravel soil is 11.2’ above water, while solid gravel is 7.61’ above water level. Gravel in situ in quarry is 7.13’ above water

Law-Smith’s Quarry in red ” gravel” section

8” sand and clay

-T=13’ above water

11” Gravel

2” Grey clay

6” Gravel

– Coxiella band

28” Clay grey on top then yellow underneath.

Basalt at 4’7”

Lake Colongulac

High levels more signif. to measure than low levels bec. Dries up. Part of lake floor never covered now.

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The tuff at the (S.) lower end of Lake Colongulac has been eroded ½ to ¾ ch. Since the deposition of the loess. This would be during the post-loess high level when the high-level alluvium (since incised) was deposited. The lake waters do not now reach the tuff.

The valley of the creeks flowing over the tuff into the lake show the tuff to be slowly eroded compared with the loess.

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Queensland Museum

1 Bones from Darling Downs allegedly chewed by Thylacoleo

2 F 14.771 Bone chewed by rodent?

Six other specimens with cuts, some of which like this.

Diagram of cut (‘V’ in section)

3 Thylacoleo Two incisors adpressed

Diagram of incisors

Thus make one spike, not two. Not act like the grasping canines of placental carnivores.

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1948

Lake Keilambete

Fence marks show lake 3’3” lower than 10 years ago = c 30’ longitudinally (NE corner below house).

Distances between successive elevations of 5’9”.

Diagram of sighting method using Abney

From lake edge up just S of fence. Up elevations of 5’8 at each fall of 33’, 56’, 71’, 132’, 188’, 233’, 288’, 346’, 392’, 413’, 423’, 435’, 448’, 462’, 494’, 520’, 537’, 552’, 568’, 599’, 629’, 661’, finally 726’ only 2’ higher than reading at 629’ i.e. going down again.

Page 90

Lake Connewarren west of Mortlake drained dry for grazing. Bed of black peaty soil.

Salt lakes near Mortlake

Mt Shadwell. Cinder cone. Very high % olivine. Olivine bombs very numerous as at Mt. Leura.

Mt Elephant. Cinder cone. Olivine not common.

Page 91

Shelford

“Red Hill”. Road cutting on W side of Shelford-Inverleigh Road (on W side valley of Leigh River) c 4 miles S of Shelford where cliff, road & river are contiguous. See Beeac Mil. Map. 065, 065

Very slight dip to South

Diagram: vertical section of cliff beside the road.

Fossils from lower 6’6” (light grey

Page 92

Clay) rich in gasteropods & pelecypods. Some corals & bryozoa. Prob. Balcombian.

Page 93

5 am 12/9/51

Lake Colongulac

Diagram; map of part of lake shore showing a headland

Headland at S end of lake not tuff as mapped by Grayson & Mahony but yellow loess as on E side of lake. Basalt outcrops at X. Dune may have been built on basalt as starting point. Ironstone may also have been involved.

Loess yellow, powdery, with concretions, no stratification, black loam on top – rabbits & thistles thrive thereon.

Auger hole at tip of headland (W). Yellow loess 6'3" but not pierced although bottom below level of base of

Page 94

Cliff. Shows headland completely loess as all higher levels shown by outcrops.

At Y, spade hole showed

Dark-grey silt	8"
Dark-yellow iron concretions & some reddish ironstone sand	2"
Yellow clay	6" +
	1'4"

At Z, spade hole showed

Dark-grey silt or clay	12"
Reddish sand & gravel (ironstone sand)	3"
Yellow clay	9" +
	24"

West of headland as shown p. 93 may have been a separate lake when levels lower. Ridges of ironstone etc. swing fr. Point to W bank.

Page 95

Mr. Woodmason owns property which includes headland at S. end of L. Colongulac. Says lake highest for 30 years. He quoted father (& Law Smith Snr. said same) that headland an island about 50 years ago. Had to wade or swim to island to catch rabbits.

Old gentleman (Mr. R--) who owns Rifle Range paddock says lake highest in his 35 years' residence.

Check on rainfall chart.

On flat above p. 96 excav., spade hole to 2'8" then auger.

2'6" Heavy, black, loamy soil

2" Pedalferric nodules and pieces of tuff

11” Decomposed tuff (increasingly tuffaceous)

Hard tuff at 3’7”

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5/9/51

Section excavated & auger hole in bed of incipient creek traversed by a drain c 100 yds W of Rifle Range & 2 chains from the cliff top. Tuff practically horizontal. In creek section 3’0” tuff & 3’6” soil over it.

Diagram; vertical section of auger hole.

Page 97

Diagram : map of headland area showing iron stone ridges and gravel pit.

Green area grassed

Gravel pits in in loose pedalferric nodules (buckshot gravel) merging into solid ironstone.

Page 98

7/9/51

West shore L. Colongulac

NE of end of road on W side of lake N of dam & windmill

Diagram: cross section of lake shore

Old lake floor consists of peaty alluvium. Spade hole pierced 2’3” without reaching basalt & ½ chain from cliff.

Page 97 (page number duplicated by Gill)

Property owner with house at end of road (N side) on W of L. Colongulac gave information of following bores which he put down himself.

1 Near lake, S of road windmill

Black soil	6’
Tuff	55’
Red buckshot	4’
Bore 6	65’

2 S of house c ¼ ml from lake & road windmill

Soil 5-6’

Basalt c 60’

Bore 7 65-70’

3 NW of house c ¼ ml

Soil & tuff – 21’ total

Bore 8

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7-9-51

Rifle Range – water – tuff base Lake Colongulac

Table of survey data

Page 99

Mr. J. C. Jehu point down a bore for a windmill in the paddock at the Sanitary Depot just E of the Rifle Range at the S end of Lake Colongulac.

Bore – Total 62’

Some black soil

Some tuff

Nearly all yellow clay

Finished in drift sand

Top c 20’ above lake floor. Note absence of basalt & cf p.97

Subdivision 15, Sect. XV, Par. Of Colongulac is basalt quarry = just N of railway line on road to old Timboon (E side).

Page 100

10/9/51

Map of SE corner lake shore showing sanitary depot and loess dune

A. Spade excavation Soil 6”

(c 200 yds N of windmill) Tuff 8”

Light-grey clay 8”

1’ 10”

B. Spade excavation into base of cliff

Soil & loess	1’4”
Tuff gravel	3”
Light-grey clay with brownish patches	8”
	2’3”

Page 101

7/9/51

Headland N. end Lake Colongulac

Diagram: cross section of headland

Not all basalt as shown on Grayson & Mahony’s map.

Page 102

“Puunyart”

7 mls NW from Camperdown, just S of Blind Creek. Information of bore from J.C. Jehu, Camperdown who put it down.

Black clay & “buckshot”	4’
Grey clay	8’
Yellow drift sand	3’
Pure white pipeclay [Pallid zone of laterite?]	20’
Yellow clay & salt water	43’
Blue marine clay & shelss	100’
Black coarse sand & shell fragments	4’
	182’

Says only case in wh. pierced blue clay. Blue clay bored for 362’ at Cowley’s Creek without piercing it; no water. Like McCrabb refuses to bore in area near Pt. Campbell bec. Of this clay.

Page 103

12/9/51

Lake Kariah Loess cliffs “10’Terrace” the same as L. Colongulac (9’ above 1951 high level)

Lake Terangpom. Section SE ???

Soil	3”

Buckshot 6”

Grey clay with bone 2’+

Diagram: map of Lake area showing dune

There appear to be loess dunes as shown above but only observed from road.

Page 104

Garvoc Caldera

Diagram. Map of caldera

Quarry 727, 790 is in tuff & lapilli. Outcrops cover a stratigraphical thickness of 11’ in quarry. Base of quarry c 15’ above flats. Tuff horizontal.

Page 105

Garvoc

Diagram of SW part of caldera

At corner by mill - 4’ of buckshot ironstone outcrops in S creek bank.

Ferug. Grit of quartz sand & gravel + buckshot in creek between windmill & bridge.

Qtz sand common in creek between caldera & bridge.

Outcrops of tuff at & near bridge. Both finely bedded & more massive.

Shows Yallock valley cut before vulcanism, filled with tuff & now being re-excavated

Windmill Bore at house shown (Panmure Mil. Map 712, 771) went through “a little tufa & then bluestone” according to owner.

Page 106

Erosion of basalt by creek before expulsion of tuff shows (as inferred from other evidence) that the basalt does not belong to the caldera eruption but to an earlier vulcanism. Basalt has strong development of buckshot.

See Mines Dept. “L’stone at Garvoc”.

Page 107

Lake Terang

Freshness mean not old? Cemetery (see M.M.) Sect. 29 Par. Of Terang is not scoria as mapped by Grayson & Mahony but lapilli (mostly) & tuff as shown by a number of grave excavations. All this hill

such as shown by low angles of slope, lack of outcrops (contrast scoria in this respect), & small pieces of tuff in rabbit burrows.

Small hill where quarry is MM Panmure 833, 820 is of masses of coarse lapilli, somewhat cemented by iron with angular pieces of basalt. Note sharper slope of hill S of quarry occasioned by

Page 108

different type of material. More like a cinder slope. Mt Terang has quarry with tuff & lapilli, above which is basalt (Grayson & Mahony Pl. 5 fig. 2)

Page 109

11/9/51

Lake Elingamite

See Book 10, p. 101, Book 17, p. 83

Crater lake

Caldera

Innumerable layers of fine ash & lapilli.

High vertical cliffs on E side, or more precisely ESE of Mt W'bool.

Tuff cliffs rise more quickly in N. than S. may be due to influence of Elingamite Creek in NW.

Cliffs roughly even in height in NE, E & SE.

Lake waters gone down in past 50 years as at Gnotuk & Bullenmerri.

Where unmade road goes to rim on ENE.

(a) Terrace a little over 3 chs wide on 11/9/51 which a high water year.

(b) Terrace at 1½ chs

Page 110

(c) Cliff 50' near vertical & c 25' more to top of rise. Total 75'

Diagram of cliff profile

Erosion means cliff is a fault line scarp round caldera ring fault.

Water fresh but creek runs from it. Function of water table.

Long low-angle slope on outer side of rim.

Page 111

Calderas

Generally 1 – 1½ miles in diameter – suggests some uniformity of collapse mechanics.

Also commonly the ash beds are horizontal at the rim, suggesting collapse as follows:

Diagram: schematic cross section through a caldera showing ring faults

Page 112

Sept. 1951

Ewan's Hill

Caldera with reservoir in collapsed area. Ewan's Hill a post-caldera cinder cone. Valleys eroded roughly N.&S. reservoir.

On E of reservoir hill consisting of truncated ash layers – numerous, fine, uninterrupted, some bands of lapilli. Sharp slope inside rim, & very low outer slope. Beds about horizontal.

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6/9/51

Lake Purrumbete

Fresh.

Roughly circular.

Water level once higher surrounding Manifold's homestead "Purrumbete" on 3 sides as protection against abos (see historical notes).

Deep. Bonwick says 150' sides of tuff & lapilli.

Diagram: map of N shore of Lake near Manifold's house.

In dotted area outcrops show band about 6' thick of strongly cross-bedded ejectamenta with numerous bombs, mostly 3" – 9" diameter

Page 114

but up to 3' diameter. Much more even in cliffs round rest of rim. Hills suggest due to rain, (Phys. of Vic. P. 176) but

(a) Beds horizontal

(b) Limited area.

High cliffs to NE & E. Low on W & S. Fading away on NW & SE. See contours Colac M.M. 4miles/1 inch. Indicates winds W to SW at time of eruption.

c. 200 yds W of NE corner of lake cliffs measured & found to be c. 75’ high. Landward of cliff ground rises another 10’ or so.

On E side for some distance the cliffs are not as high –

Page 115

This is due to faulting. Numerous faults of various throw & hade.

Diagram of fault structure

This structure where fenced road down cliffs.

Beds AB laid down slumped to E. Beds B faulted & ends of beds turned up against fault.

Unconformity followed for about a mile & seen in many places. Typical section as shown below.

Page 116

Landslides during eruption?

Diagram of an angular uncomformity

Photo of an angular uncomformity

1. Beds A deposited.

2. Collapsed to give steep dip, & faulted to truncate beds along line shown.

3. Volcano continued activity & beds B laid down. This rather than faulting suggested as no signs of disturbance in beds B, angle one of

Page 117

possible deposition & relations maintained for about a mile.

Photo of Lake Purrumbete cliff

Three Photos of quarry S of Mt Leura

Page 118

8/9/51

Camperdown

Cutting on N & E sides of large reservoir on Camp – Cobden road shows abundant buckshot on tuff.

S.E.C. pole excavations on next ½ mile of road to Cobden show buckshot, soil & tuff. Older than cinder cones.

Quarry S of Mt Leura (N) near road running E from Camp-Cobden road. Basalt with many inclusions of earlier rocks. Apparently ~~Miocene limestone~~ Jurassic sandstone and cross-bedded silt. (c ¼ ml)

At house on S side (c. 1/4ml) of this road opposite quarry bore put down 360' but no information on what traversed.

Page 119

Mt Leura

Diagram of caldera rim profile.

Temporary lake on caldera floor. Where rim changes direction to run towards Lake Bullenmerri, the slope is much lower.

Page 120

Quarries on highway E side of C'down near Mt. Leura.

1. N. side (rubbish dump)
In basalt which vesicular, columnar, weathered, "Earlier" basalt.

2. S. side (basalt quarry)
At entrance on W side of gate.

Diagram: Cross section at quarry gate

At this point either cliff in basalt or a fault. Ridge continues S for about a mile.

Page 121

3. Cinders & Basalt Quarry on N side of highway, E of C'down]

Diagram of east wall showing a fault.

Fault because sharp truncation of cinders layers; also dip towards vent instead of away from it. Fault strikes E 20^{o} S.

Page 122

South Wall

Photo and diagram of south wall.

Dark chocolate soil extends down in pipes into reddish brown cinders. Pipes roughly circular in cross-section.

3" from bottom of pipe 9" wide

2' from bottom of pipe 16" wide

4’ from bottom of pipe 23” wide

Page 123

Diagram of soil profile E end of quarry

Diagram of section in middle of quarry S of track to lower level.

Page 124

Diagram: wall section above platform

A little of the massive yellow lapilli-tuff on top of cinders but this mostly fills hollows.

On the lower N side there is the best development of the yellow to light-brown finer ejectamenta. Measured section as follows:

Page 125

Diagram; Vertical section of N wall

Cinders in highway road cuttings on E slope of caldera complex. A little yellow ash also.

See P. 151

Page 126

History Mt. leura

1. Ash volcano

2. Caldera formed

3. Blackish cinders as in quarry figured opposite

4. Collapse giving vent-wards dip of cinders

5. First lava flow

6. Further cinders ejection

7. Second lava flow

8. More cinders

9. Massive lapilli & tuff. On Mt. Leura cinders is followed by some scoria & spatter.

10. Soil formation

Page 127

Lake Bullenmerri 13/9/51

Section – Cutting S side road rising to West of ridge separating Lakes Gnotuk & Bullenmerri, near Camperdown.

Diagram: Road cutting strata

See Grayson & Mahony Pl.4 fig2.

Page 128

Top

9. Soil

8. 15' grey, very finely bedded tuff & lapilli. Strike N 25° E

Dip 8° W

Similar dip & strike to 7 but not quite the same.

7. 4'6" light-brown or dark yellow tuff. Lower 1'6" is softer & not stratified. 3' harder & finely stratified. Slightly disturbed – small displacements.

Dip 7° W

Strike roughly N. Hard to determine with low dip.

6. 3' to 15' reddish scoria. Occupies area of change of dip & strike.

5. 1'6" solid, dark-grey basalt Dip. 25° NW

Strike c N 55° E

4. 4'6" reddish scoria~~ceous lapilli~~ merging into scoriaceous basalt.

3. 1'6" reddish scoriaceous lapilli.

Page 129

2. c 15' reddish scoria.

1. 6'+ vesicular basalt.

Age of 1. Not certain.

Age of 2-8 "Later basalt"

Series of Grayson & Mahony

Two photos of terraces, Lake Bullenmerri.

Page 130

Three (unlabelled) photos of Lake Bullenmerri.

Page 131 and 132

14/9/51

Water level to top of main terrace, N end Lake Bullenmerri

Table of survey data

Photo of surveyed section

Page 133

Diagram of surveyed section showing 50’ terrace

Page 134

14/9/51

Lake Gnotuk

Many fewer fossil bones perhaps bec. More salty. High terrace c 80’ above crater shows level once nearer that of Bullenmerri. Prob. In pluvial period when Gnotuk collected excess from Bullenmerri.

Tertiary outcrop with numerous fossils on E side.

Page 135

Pirron Yallock Cr.

Right (E) bank on N side of Princes Highway bridge.

Top.

(6) 4’ alluvial soil, dark-grey to black. Brownish streaks in lower 18”. Tuff decomposing on top & dark alluvium penetrating cracks in tuff.

(5) 2’6” finely stratified tuff, brownish-grey & yellow. Some inches of thickness with ripple marks (near top).

(4) 6” slate-grey clay (darker than 3)

Clear break to

(3) 8” light-grey clay.

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(2) 1’3” clayey quartz gravel bed yellowish in general colour, white qtz, clear qtz, ferrug. sandstone pebbles.

(1) 4'+ mottled light-grey, yellow & light-brown clayey silt with small harder ferrug. lenticles. This bed goes down under water.

Suggest time when lake extended over this area i.e. pluvial period. Ash ejected at this time. Later than Stony Rises to which stream marginal. Oxidized beds (lower) followed by reduced beds

Page 137

(high level) when ash ejected: history like Lake Colongulac.

Lake Gnarpurt

Middle of natural causeway separating L. Gnarpurt & L. Corangamite apparently eroded by lake when at high level & combining above two lakes. Fossil Coxiella through deposit. Somewhat lost yellow colour so that greyish-yellow. Soil on top now.

Diagram; vertical section through causeway.

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15/9/51

The Basins

Diagram: map showing location of the basins

Shaded basin is a caldera apparently with lake, high rims N & W, low on S. Slowly rising on E but rapid on W.

Page 139

Lake Corangamite

On E shore c 1 ½ mls NW of Corunnun where road contiguous with lake.

Diagram: cross section from dune to lake showing old lake sands.

Map showing location of Corunnun and Wool Wool.

Page 140

Map showing location of lava blisters near Wool Wool

Page 140A

17/1/53

Alvie

Cutting S side of E-W road at Alvie School. Beeac Mil. Map 1"=1 ml. 607, 817

Tuff & lapilli

Dreeite

Lava Blister photographed on east side of Read's Rd, c. ¾ mile N of junction with Wool Wool Road. Lake Corangamite Mil. Map 2 mls = 1" c 1 ½ mls S. of T corner with school & church.

Page 140B

17/1/53

Lake Corangamite

2 mls. W. of Nth. Cundare. Large area of Lake Corangamite marked as lake on Lake Corangamite 2 mls = 1" printed 1941 military map (information correct to June 1916) but as swamp in Beeac Mil. Map 1" = 1 ml. 1948. From air photos taken 1947.

Edge of lake here in form of cliff with c. 22^{o} slope. Cracked strongly due to clay of dune material.

Lake Cundare

(Loess) clay dune on east & SE sides cliff up to 12' high cut in dune by lake. Flake of quartzite found on top of cliff.

Page 141

Road cutting on Dreeite Nth road on bend opposite S shore of peninsula south of Pelican Point & c 3 mls N. of road junction to Dreeite Sth. Colac 4 mls / 1 in. M.M. 637, 295. Light-coloured dune material on top of Stony Rises.

c. 1 ml S of Cundare turnoff.

Opposite N shore of peninsula S of Pelican Point where lake shore turns N.

Diagram: cross section of stony rises basalt overlain by dune.

Proves Stony rises older than arid period when dunes built.

Page 142

Road cutting 8' deep Beeac M.M. 1/1 628, 956.

Broken Coxiella abundant in dune "silt".

MM 633, 966 Road runs along top of 20' cliff which cut in windblown material cf. post-dune pluvial cliff at Lake Colongulac.

Further E road cutting at top of hill shows this a dune.

Buckshot Lake Corangamite

2 mls = 1"

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7/12/51

See Book 7:125-128, 55:27, 21:146-147

Warrnambool Footprints

See also Book 7, p 125

[1] 14’ of impressions showing in a parting in a huge block of aeolianite at Table Cave near Thunder Pt.

Diagram of location of footprints

Page 144

Slide of footprints stapled to page.

Indicate a 4-footed animal. 26 whole footprints.

Two photos of footprints. (2 a continuation upwards of 1)

Suggestion of 3 toes on a few imprints.

cf imprints at Thunder Pt. found by Bro. O. Stanley, science master Xian Bros. School, W’bool. See letter 18/3/66.

Page 145

[2] Giant Bird

Two photos of footprint.

Diagram of footprint.

Page 146

[3] Giant ?Kangaroo

Evidence of 3 large & long toes. No opportunity to see if impressions side by side. In trail first examined a second print 2’8” away (centre to centre)

In another –

Diagram of part of a trackway (2 prints)

Page 147

If this correct may not be hopper like M. canguru.

[4] Impressions of small feet such as of a native cat.

1/2/52

[5] Diagrams of 2 3-toed prints of unknown animal

cf. seagull – not spread enough.

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[6] Diagram of 2 bird like footprints

cf. emu.

Page 149

The ~~slow~~ four-footed animal left uniformly good prints – probably slow while fast running birds left only occasional good ones.

Ripple Marks

Made by wind in sand preserved. Shallow 3 1/2" from ridge to ridge.

See Book 21, pp. 146-147.

7, pp. 125-128.

Page 150

Lake Colongulac

Yellow clayey material at south end of Lake Colongulac outcropping on former lake bed opposite mass of buckshot.

On being washed noted (see slide with material)

Pieces of Coxiella

Another smaller planispiral gastropod.

Ostracod.

So Quaternary lake deposit as yellow clay elsewhere – not Tertiary marine as outcrops round Lakes Gnotuk & Bullenmerri.

Page 151

Camperdown

Quarry N side of Princes Highway

Photo of east wall of quarry

Two photos showing fault with basalt collapsed over cinders. Cinders dip towards crater. Beds of cinders truncated.

Page 152

Photo of south wall. Contact between cinders & basalt.

Soil in E wall (marked on photo opposite) 3’ deep.

Leeper “Very young soil. Immature clay loam with lower foot only differing through having less organic matter. Good granular structure.”

Page 153

Leeper

Camperdown Reservoir

On top of hill 1 1/2 mls S of Camperdown. Excavation shows well-developed podsol.

Leeper “Mature profile

A horizon-silt-loam. Leached Two parts of A clearly seen on E side.

B horizon – red, yellow & grey mttled clay with plentiful dried-pea size buckshot.”

3’

Apparently older than the Mt. Leura scoria p. 151.

Page 154

Leeper

Allansford

Road cutting c 10’ high ¼ mile before reaching Allansford Hotel corner (going W) on Princes Highway.

8” light reddish leached soil. No lime.

1’ buckshot horizon Solodic soil.

9’ red soil. Krasnozem

Very mature soil & very deep. Often called a “Terra rossa” but this properly a soil on limestone. Buckshot not form on limestone. Ca ions inhibit chemical process – anti catalyst for that reaction.

Page 155

Leeper

Thunder Point

Prof. Geoff Leeper says – Soil very sandy. Colour not always to be relied on.

Albert Park Quarry

Diagram; Quarry wall profile

Soils thinner when developed on hard aeolianite.

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21/1/52

Leeper

Princes Highway, W. of Dennington

Diagram: soil profile

Two soils same in texture. Question whether colour diff. signif. Pipe formation indicates solution not forming since Tower Hill erupted – suggest rainier period before Tower Hill than since. Pipes start by easier track

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for water – down root(s) or place of looser texture in rock. Also associated with hollows of surface.

Test soils by removal of organic matter. Boil up in hydrogen peroxide after letting stand overnight to destroy organic matter.

Texture tested by working up with a little water in fingers to see how clayey or silty or sandy. If clayey whether sticky or not, tough or not.

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Buckshot Formation

Waterlog soil to remove oxygen and so turn iron to ferrous condition. Anaerobic bacteria use manganese (if any) then iron. When iron reduced to ferrous condition, it is very mobile.

When air re-enters, the iron becomes oxidized to the ferric condition. So buckshot. Reversal not easy although must take place. Buckshot pebble small surface area relative to volume compared with the finely divided iron in the soil.

Why nodules are formed, i.e. the iron aggregates at particular points is not

Page 159

understood. Why diff. sizes of nodules in diff. places not understood. A function of age chiefly. Matrix also an effect. Apparently new iron oxide forms more readily on other ferric iron & so nodules grow.

Each time ground waterlogged again, prob. Bacteria use some of nodules' oxygen but for reason given relatively small amt. digested & nodule grows.

If became continuously waterlogged by change in ecology or general climate, then can imagine slow digestion of the nodules by bacteria.

"The land is all buckshot & sorrow. It cries like a prayer – " Shaw Neilson

This buckshot country lateritic highly leached & very poor!

Page 160

Glenelg River

Nelson Kiosk Mr. Dave Cameron

Mr. J.F. Holloway

Private Bag, Mt. Gambier

Mr. W. Vause (Abo implements)

Millicent Rd., Mt. Gambier

Mr. J. Hutcheeson (Propr. Princess Margaret Rose Cave)

Caroline P.O.

Via Mt. Gambier, S.A.

Mr R.G. Holloway

Radio & Elec. Apparatus

299 Lt. Lonsdale St., Melb. Cl. Cent. 3466.

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Warrnambool

Harbour Master	Capt. Carrington
Town Clerk	Neal
City Engineer	G.M. Chisholm
Shire Engineer	R. Crawley
Manager "Standard"	Mr. Chas Hallowell
Editor "Standard"	Mr. Bruce Morris

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Goose Lagoon

Mr. John McNamara

“Boodcarra”,

Private Bag,

Port Fairy

Owner of property W. of “Leura” & Goose Lagoon.

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Camperdown

1. Mr. P.G. Law-Smith, (son of owner of “Chocolyn”)

Henderson Street,

Camperdown (Phone 411)

Succeeded by Mr. R. Hooper

2. Mr. J.C. Jehu, (Driller)

17 Errey Street,

Camperdown (near high school)

3. Mr. R.A. McAlpine, Rate collector (Hist. of C’down)

Shire Office

Manifold St.,

Camperdown

4. Mr. Thos. F. Little

Shire Secretary, Camperdown

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Dennington

Nestle’s Works

Manager Mr. Geo. Nicholl

Engineer Mr. D.F. Shilson

Asst. Manager Mr. A.E. Bradley

Manager

Quarry Owner

Mr. J.S. Moulden, Dennington P.O.

Pages 165 & 166

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