APPENDIX.

On a new Genus of large Wingless Bird (Dromornis australis, Owen) from a Post-tertiary Deposit in Queensland, Australia.

In 1836 Sir Thomas Mitchell, F.G.S., Surveyor-General of Australia, discovered in the breccia-cave of Wellington Valley a femur, wanting the lower end, mutilated and incrusted with the red stalagmite of the cave, which I determined to belong to a large bird, probably, from its size, struthious or brevipennate, but not presenting characters which, at that time, justified me in suggesting closer affinities. Three views of this fossil, of rather less than half the natural size, formed the subject of pl. 32. figs. 12, 13, of my “Palæontological Appendix” to Mitchell’s work.

The length of this fossil was 13 inches, the breadth of the middle of the shaft was not quite 3 inches.

In 1869 the Rev. W. B. Clarke, F.G.S., Government Geologist of the Province of New South Wales, made known the interesting discovery of a femur, nearly 12 inches in length, during the digging of a well at Peak Downs, in Queensland.

The well was sunk through 30 feet of the black trappean alluvial soil common in that part of Australia, and then through 150 feet of drift pebbles and boulders, on one of which boulders (“at that depth,” 150 feet?) rested a short, thick femur, so filled with mineral matter (calc spar and iron pyrites) as to give the internal structure more the appearance of a reptilian than an ornithic bone.

Mr. Clarke submitted this fossil to the able Curator of the Australian Museum, Sydney, and states that “Mr. Krefft has compared it with a collection sent over from New Zealand by Dr. Haast, and has been enabled to determine it to be a bone belonging to Dinornis.” The communication is accordingly headed “Dinornis, an Australian genus.”

So exceptional an extension of New-Zealand forms of life to the Australian continent greatly added to my desire of further and more intimate acquaintance with this second evidence of a large extinct Australian bird—more especially as the femora of Dinornis received from New Zealand subsequently to the publication of Mitchell’s work led me to perceive, from the antero-posterior compression of the shaft and the sessile position of the head in the femur from the Wellington-Valley cavern, that it resembled that bone in the Emu rather than in the Dinornis.

My wishes on this point, as on others connected with the palæontology of Australia,
met with a prompt and hearty response. The Trustees of the Australian Museum directed the unique bird's bone to be moulded, and they forwarded to me a plaster cast.

Mr. Krefft was so good as to have three photographs taken of the fossil:—one showing the back view of the bone, three fifths the natural size; the two others the front views of the proximal and distal halves of the bone, of very nearly the natural size.

With these evidences a satisfactory comparison can be made of the Australian fossil with the femora of other large wingless birds, both recent and extinct.

The bone is the right femur (Pl. C.). It measures 11 inches 6 lines; and there may be an inch more of this dimension lost by the abrasion to which both ends have been subject. The middle third of the shaft is entire, and shows its natural form and surface; the breadth of this part is 2 inches 6 lines; the antero-posterior thickness does not exceed 1 inch 7 lines (ib. fig. 2). The extreme breadth of the upper end is 5 inches 3 lines, that of the lower end is 5 inches; but these latter dimensions fall short, probably by half an inch, of those which the unabraded or entire femur would have yielded.

Of the femora of Dinornis I selected for comparison that of Din. elephantopus¹, as nearest to the present fossil in regard to length (13 inches); the breadth of the shaft is the same, or, in the largest examples of D. elephantopus, exceeds only by 2 lines that of the Australian femur.

But the shaft of the bone in Dromornis is compressed from before backward; its transverse section is a narrow oval (ib. fig. 2), while that of the Dinornis is a fuller and less regular oval (ib. fig. 3) from the greater proportion of fore-and-aft breadth of the shaft. The back part of the shaft of Dromornis australis, besides being less convex transversely, is devoid of the strong ridges and tuberosities which characterize that part in all the species of Dinornis; in this respect, as in the shape of the transverse section of the femoral shaft, Dromornis resembles more that bone in the Emu (Dromaius ater). The bifurcate anterior muscular ("intervastal") ridge which characterizes the fore part of the femoral shaft in Dinornis elephantopus, as in other species of that genus, is not defined on that part of the femur of Dromornis. The longitudinal ridge, descending from the pretrochanterian ridge to the ectocondylar expansion, is traceable in the cast, but is less strongly marked than in Dinornis. The mutilation of the prominent parts at the proximal end of the femur begets a reticence in drawing conclusions from apparent differences; but some were evidently inherent in the original when entire. The periphery of the head of the femur (d) is not constricted so as to give the appearance of a "neck," as it is in Dinornis.

The trochanterian part of the articular surface (c) is more horizontal, does not ascend as it recedes from the head, in Dromornis. So far as the trochanter (f) is preserved in the cast, and appears in the photographs, it does not rise above the level of the head (a) of the femur, and seems not to have risen, when entire, so much above it, as in Dinornis; the lay of the trochanterian articular tract agrees with these indications of the remain-

¹ Pl. LVI. fig. 1.
ing epitrochanterian ridge \((f')\). In the above differences *Dromornis* more resembles *Dromaius*.

The eotrochanterian surface is slightly concave, bounded above by a low arched ridge, from which the rough convex epitrochanterian part of the surface ascended to the crowning ridge. In this character *Dromornis* resembles *Dromaius*, and differs from *Dinornis*.

It resembles *Dinornis*, and differs from *Dromaius*, in the absence of the pneumatic foramen at the hind part of the upper expansion of the femur. This expansion is also relatively greater than in *Dromaius*, and recalls rather that of *Dinornis*; but the breadth of the eotrochanterian tract is relatively less than in *Dinornis* *gravis*, and still less than in the exceptionally thick and massive femur of *Dinornis elephantopus*. The fore part of the upper femoral expansion has had its outer wall crushed in; but, in both the cast and the photograph, there is an indication of a rough subcircular tract, answering to that which is conspicuous in *Dinornis* (Pl. LVI, fig. 1, \(i\)), but which is not present in *Dromaius*.

The outer crust of the femoral wall has been crushed inwards at the distal third of the fore part of the shaft; but the rotular surface seems to have been broad and shallow. In the prominence and thick convexity of the fore part of the expansion of the outer condyle *Dromornis* resembles *Dinornis* rather than *Dromaius*. The transverse extent of the distal end, in proportion to the size of the shaft of the femur, is less than in *Dinornis*, but is greater than in *Dromaius*.

The popliteal cavity (Pl. C, fig. 1, \(z\)) is oblique, and is deeper and better-defined, especially above, than in *Dinornis*; it is divided from the intercondylar cavity \((v)\) by a ridge \((w)\) similar to that in *Dinornis*, and which I do not find in *Dromaius*. The intercondylar cavity or pit \((v)\) is deep, and smaller than in *Dinornis* *gravis*; it is deeper, but much smaller, than in *Dinornis* *elephantopus* (loc. cit. pl. 43. fig. 3). There is a rough "gluteal" depression (ib. fig. 1, \(x\)), less deep than in *Dinornis* *gravis*, and situated nearer the popliteal cavity, and with a more posterior aspect than in *Dinornis* *elephantopus*.

The mutilation of the prominent parts of both femoral condyles precludes further profitable comparisons of the fossil under consideration.

But from those for which it affords sufficient grounds, I infer that in its essential characters this femur resembles more that bone in the Emu than in the Moa, and that the characters in which it more resembles *Dinornis* are concomitant with, and related to, the more general strength and robustness of the bone—from which we may infer that the species manifested dinornithic strength and proportions of the hind limbs, combined with characters of closer affinity to the existing smaller, more slender-limbed, and swifter wingless bird peculiar to the Australian continent\(^1\).

\(^1\) I can now repeat with more confidence the remark in my Memoir on *Palapteryx* :—"No remnant of a *Dinornis* has yet been found in any of the contiguous islands; and I have in vain searched for such in the collections of post-pliocene fossils from Australia."—*Ante*, p. 136.
From the proportions of the femur of Dromornis I infer also that those of the tibia and metatarsal would be longer and more slender than in Dinornis elephantopus, and in a greater degree than is the case with the femur. Consequently the stature of Dromornis would be greater in proportion to the solitary bone by which we now know it than is that of the Dinornis elephantopus. We may therefore have a comfortable assurance that it indicates the former existence in Australia of a bird nearly of the stature of the Ostrich, but with relatively shorter and stronger hind limbs.

The period at which this large wingless bird trod that singular land was that at which the elephantine Marsupial (Diprotodon) flourished. I have received remains of both this genus and the somewhat smaller pachydermal Marsupial (Nototherium) from the mass of drift and boulder deposit when this had been reached, at depths equal to that yielding the bird’s fossil at Peak Downs, in the sinking of wells in Queensland.

The mineralized condition of these herbivorous mammalian fossils has suggested a comparison of them with the fossil remains of Saurian Reptiles from Oolitic and even older Mesozoic beds in England. Yet the Mollusca which have left their shells with the petrified Australian bones are of the same species as those still living in the fresh waters of the Condamine and its tributary creeks, in the bed of which so many evidences of extinct Marsupial life have been discovered.

From the general analogy, not unfrequently pointed out, between the recent animal and vegetable forms of the Australian continent and the extinct ones of the European Oolitic beds, together with the massive mineralized condition of the ornithic and mammalian fossils found deep in the enormous superficial accumulations of drift and trappean alluvium, we are led to surmise that Australia, or parts of that continent, have not been subject to the frequent movements by which the earth’s crust has been modified in the European continent, but that it may have been subject exclusively to the subaerial conditions of change from the period of the Oolitic deposits in our hemisphere. Thus the Dromornis of Queensland may have been contemporary with the impressors of the ornithicnites of Connecticut.

DESCRIPTION OF THE PLATE.

PLATE C.

Fig. 1. Back view of the femur of Dromornis australis.
Fig. 2. Form of transverse section of middle of the shaft.
Fig. 3. Form of transverse section of the same part of the femur of Din. elephantopus.
**Dromornis australis** from New South Wales and South Australia.

A second evidence of a large and, by the texture of the bone, wingless bird, has been transmitted to me from South Australia. It was found in a cavern in the ‘Mount Gambier range’ of hills in that province.

It is the lower portion, with the articular end a little mutilated, of a left tibia (Plate CXVIII.). It corresponds in size with the same part in *Dinornis elephantopus* (Plate LVI. fig. 4), and is rather larger than that of *Gastornis parisiensis*. The modifications of the distal end of the tibia, being, as pointed out in the ‘Paper’ quoted below, more salient and characteristic than those of the femur, the present specimen is valuable as a test of the conclusions drawn from the subject of Plate C.

As to the first difference which I note in the Australian fossil tibia, the bone resembles that of *Gastornis* and differs from that of *Dinornis*, viz. in the medial position of the ‘precondylar groove’ (Pl. CXVIII. fig. 1, p). In every species of *Dinornis* this groove is near the inner (tibial) margin of the fore part of the bone (see Plate LVI. fig. 4, and Pl. XLII. fig. 1, p, *Dinornis gravis*). In both *Dinornis* and *Gastornis* the groove is crossed by a bridge of bone. Of this bridge there is no trace in the present Australian fossil, and there is no evidence of fracture of the piers of such a bridge. The margins of the groove whence the bridge springs in *Dinornis* are, in *Dromornis*, broadly convex and entire. *Dromaius* and *Casuarius* have the precondylar groove, but not the bridge. In both the groove is not medial, as in *Dromornis*, but is nearer the inner border of the tibia, less near, however, than in *Dinornis*. In *Struthio* there is neither groove nor bridge; but in place of the groove there is a transverse rising of the bone. *Apteryx* offers a miniature resemblance to *Dinornis* in the tibial character of the precondylar groove.

The distal expansion is relatively less, in comparison with the shaft of the tibia, in *Dromornis* than in *Dinornis elephantopus* (the species which *Dromornis* most resembles in the size of the shaft). The inner border of the distal end of the shaft (Pl. CXVIII. fig. 3, a) is broader than in *Dinornis*, in which it contracts almost to a ridge as it passes to the beginning of the posterior production of the inner (tibial) condyle. In *Dromornis* the corresponding part of the shaft, a, maintains a smooth transverse convexity to the condyle s. The anterior production of the inner boundary of the rotular part of the intercondylar space (ib. fig. 2, b) is more prominent in *Dromornis* than in *Dinornis*. The hind part of the inner condyle (ib. fig. 1, s) is less produced than in *Dinornis* and the corresponding part of the outer condyle, t, is less convex. There is no definite cavity below the precondylar groove for the antentocondylar prominence of the metatarsal.

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6 Quarterly Journal of the Geological Society of London, August 1856, pl. iii. p. 204.
2 Anat. of Vertebrates, ii. p. 78.
There are other minor differences; but the above-defined patent ones sufficiently establish the fact of a nearer resemblance in the tibia, as in the femur, of the gigantic wingless bird of Australia to the genera still there represented (Dromaius and Casuarius), than to Dinornis, Apteryx, or Struthio.

The following are comparative admeasurements:

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<tr>
<td>Transverse breadth of the shaft of the tibia at the commencement of the distal expansion</td>
<td>4 1/2 in. lines</td>
<td>2 in. lines</td>
<td>1 in. lines</td>
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<tr>
<td>Ditto ditto distal condyles</td>
<td>4 in. lines</td>
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The fossil above described is in a more mineralized condition, consequently of greater specific gravity, than any bone of Dinornis which I have hitherto received. It is supposed to have come from a cave in Mount Gambier, South Australia; but I can only speak with certainty as to the locality, not as to the circumstances of its discovery.

One cannot, of course, state confidently that it is a bone of the same species of bird as the mutilated femur from the Cave of Wellington Valley, or of that from the drift at Peak Downs, in Queensland.

But the relation of size to these bones, and the difference of proportion to the tibia of Dinornis exemplified in the above-given admeasurements, oppose no obstacle to the reference, rather support it, and bear out the inference deduced from the femur.

The third evidence of Dromornis is a portion of the pelvis, 5 1/2 inches by 4 1/2 inches in size, including the left acetabulum. It was disinterred from a depth of 200 feet at the 'Canadian Gold Lead,' in New South Wales, and was kindly transmitted to me by the Rev. W. B. Clarke, M.A., F.R.S. I have minutely compared this fragment with the answerable part of the pelvis in other birds. It differs least, save in size, from that part in Dromaius. From the species of Dinornis (D. elephantopus and D. robustus) the pelvis of which is about the size of that yielding the portion in question, I note the following differences:—The acetabular outlet has a more circular form in Dromornis; the acetabular origin, or base of the pubis, is longer, while that of the ischium is shorter. The following are admeasurements:

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<tr>
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<th>Dinornis australis.</th>
<th>Dinornis robustus.</th>
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<tr>
<td>Acetabulum, vertical diameter</td>
<td>2 in. lines</td>
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<td>Acetabulum, transverse diameter</td>
<td>2 in. lines</td>
<td>2 in. lines</td>
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<tr>
<td>Pubis, extent of preserved base</td>
<td>3 in. lines</td>
<td>3 in. lines</td>
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<tr>
<td>Ischium, from lower border of base to ridge</td>
<td>3 in. lines</td>
<td>3 in. lines</td>
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Dromornis had an extensive range in Australia. It has left remains in Wellington Valley.

1 Mitchell's 'Three Expeditions into the Interior of Eastern Australia,' Svo, "Palæontological Appendix," pl. 32. figs. 12, 13 (1838).

Valley and in Goree, near Mudgee, New South Wales, at Peak Downs, in Queensland, and in the Mount Gambier range in South Australia. From each of these localities the witnesses concur in testifying to an addition of another genus of gigantic birds to the unwinged group—a genus which existed and has become extinct in the Australian continent, and which had closer kinship with the still existing struthious genera of that continent than with the extinct Moas of New Zealand.

DESCRIPTION OF THE PLATE.

PLATE CXVIII.

Distal portion of tibia of Dromornis australis.

Fig. 1. Back view.
Fig. 2. Front view.
Fig. 3. Inner side view.
Fig. 4. Broken end of shaft, showing thickness of wall and size of medullary cavity.